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EDITORIAL.

THE EFFORTS being made in California to kill the dishonest forms of mining enterprise, deserve cordial support. By a new law, providing for the punishment of such offences, the State Mineralogist has obtained the power to investigate the representations of tricky promoters, as conveyed in circular and prospectus, and he is using this opportunity to good purpose. Such work conscientiously accomplished will add greatly to the value of the office he holds.

WE ARE ENABLED, by the courtesy of a correspondent, to publish a table giving the fineness of Asiatic gold, as it is mined at a number of localities in Japan, Siberia and Manchuria. This table exhibits great diversity and may prove useful in estimating the commercial value of known quantities of the metal and in identifying bullion.

AN ILLUMINATING discussion of a difficult subject is presented in Mr. George F. Becker's article on 'Simultaneous Joints,' which it gives us particular pleasure to publish. Mining engineers already owe much to this distinguished author for earlier contributions to the physics of geological phenomena, and they will find this one most instructive.

THE OUTPUT of gold on the Rand has now surpassed all records and appears destined to maintain a further steady increase for several years. In May the production was 416,000 fine ounces, equivalent to an annual yield in excess of $100,000,000. It is an interesting question, for economists to answer, how the commerce of the world would have been affected had not this yearly contribution of gold been forthcoming at this time from a region unknown to the industrial world of a generation ago.

ACCORDING TO THE Japan *Gazette,* the gold-mining industry of Japan, heretofore comparatively small, has received active encouragement from the Government recently, with excellent results. Working of the lode mines has been pushed, and the number of men engaged in placer mining has largely increased. The result is that the production last year showed an increase of more than 50% over any previous year. For the twelve months ending with February last, the output was 9,000,000 yen in value. To this is to be

added 3,000,000 yen from Formosa, making a total of 12,000,000 yen—about $6,000,000—from Japanese territory.

THE UTILIZATION of waste gas from coke-ovens presents wide possibilities. Undoubtedly an important source of power exists in these gases. The record of experience at certain English collieries, given on another page, is of interest as showing one way in which they are now being used.

THE ACTION brought by Mr. R. B. Gleisberg against the Associated Gold Mines Company of Western Australia, resulted in damages for the engineer referred to. Mr. Gleisberg refused to allow Mr. Ledoux, a visiting director, to give orders behind his back and try to elicit information from members of his staff. For this he was dismissed. We are glad to note that the plaintiff was awarded the full amount of his claim.

THE MINING COMMUNITIES in the Northwest shortly to be visited by the American Institute of Mining Engineers evidently intend to offer a hospitality devoid of all arctic frigidity. The good people at Dawson have sent out a special invitation to every member and accompany it with a program that includes a game of baseball at midnight, and a banquet, the time of which is not stated. Even those who will not be able to accept must appreciate the kindness of these mining friends in the Far North, and our only regret is that the attendance of visiting members may not be in proportion to the magnitude of the preparations to entertain them. If the number proves small, it will be due to the fact that the summer months constitute the mining engineer's most busy period.

IT IS WITH pleasure that we reproduce the notes, given elsewhere, on the renewal of friendly relations between the Canadian Mining Institute and the Canadian Society of Civil Engineers. There has been a certain feeling between these two prominent associations, into the origin of which it is not necessary to enter at present; and the establishment some time ago of the mining section of the Society of Civil Engineers was accepted by many as a move in direct hostility to the Institute. Now, however, the main causes of difference have been fortunately removed, and there is every probability that the two societies will hereafter work in harmony, which will certainly be for the best interests of both. We ought to add that the reconciliation is largely due to the good offices of Mr. J. Bonsall Porter, of McGill University, who is an active member of both associations.

THE ARTICLE describing the ore deposits of Bingham will be widely read. To mining men interest in the subject is heightened by the growing importance of this district in Utah, and to geologists the complicated character of the structural relations will appeal. The evidence is unusually conclusive regarding the intimate relation between the distribution of ore in the limestone and those intrusions of igneous rock to which the metamorphism of the limestone is due. On the other hand, the occurrence of copper is not confined to the rock chemically most soluble, but extends into the monzonite porphyry, which is the prevailing irruptive. Mr. J. M. Boutwell is to be congratulated on the useful results of his scientific investigation, carried out in behalf of the United States Geological Survey.

THE GREENE GOLD episode throws further light on the prevailing code of morality among the directors of mines. In that code there is no clause referring to the protection of shareholders; the principal idea is to do unto others as they would do unto you, but to do it first. In the case of the Greene Gold, as in that of the Copper company, a coterie of directors gets an examination and report of the mine, under cover of securing information valuable to the company—that is, the stockholders—and when the report has been received it is squelched, pending the misuse of it for stock-gambling operations. We do not admire Col. W. C. Greene's magnificent irresponsibility and dangerous optimism, nor the tiresome iteration with which his name has been given to several mining organizations, in a manner only calculated to confuse; but we hold that the unscrupulous methods of the gamblers on Wall Street are even more dangerous to the investing public.

THE ROYAL TECHNICAL High School at Dresden, Germany, has been recently supplied with a new and elaborate equipment; the department of mechanical engineering and related practice is described in 50 large folio pages of the *Zeitschrift des Vereines Deutscher Ingenieure*, for May 27, 1905, with 70 illustrations. The prominence generously accorded to a leading technical school by such an important technical journal is an evidence of that fundamental reverence for professional training which makes Germany what she is in her economic utilization of all her material resources.

Pyrite Smelting.

The discussion on this subject is provisionally closed in this issue with an invaluable contribution by Mr. J. Parke Channing; that is to say, the particular exchange of views growing from the ten questions that we submitted two years ago has reached a point where a line may fitly be drawn. Other discussions on this subject will doubtless arise and each later one will afford knowledge more accurate than its predecessor, until finally that metallurgical millennium is reached where theory merges perfectly into practice and there is nothing more to be said. However, that date belongs to the Greek Kalends. In the meantime, the close of the present discussion marks a stage of progress which is epitomized by the experience of the technical men at the Tennessee Copper Company's smelter as expressed by their administrative chief, Mr. Channing. During the period of two years covered by the interchange of views on pyrite smelting, Mr. Channing and his associates have been applying the ideas distilled from this discussion, and at their smelter they have endeavored to work out some of the problems incidental to the development of a successful metallurgical enterprise. It speaks well not for them only, but for the new spirit which has come over the profession, that information of so detailed a kind should be given for publication where it will prove of most direct service to the industry. We shall be much surprised if the generous spirit thus evinced is not met half-way by those in charge of similar metallurgical enterprises, who may possess data valuable to the officers of the Tennessee Copper Company.

It cannot be said that pyrite smelting has yet reached its culmination; on the contrary, it is obvious that many questions remain unanswered and that the best men are strong in the belief that radical development is probable in the near future. The question of hot *versus* cold blast has been well ventilated, the part played by the coke has been ascertained, the influence

of zinc is recognized, and so forth; but the main point, the possibility of concentration, of making a matte of high percentage from low-grade ore in one operation, eliminating the cost and the loss involved in repetition of treatment, this is a problem upon the successful solution of which the future of this branch of copper metallurgy mainly depends.

How to Get There.

During the past two years we have endeavored to emphasize the need for greater precision in the use of technical terms, and the value of clearness of expression in technical literature. People who preach are apt to be considered presumptuous, and, at best, the advisory form of address is likely to become tiresome. This has been the fate of some of our efforts. Nevertheless, we are not without hope of having achieved at least a part of our purpose, and that expectation has not been lessened by observing the attention drawn to the subject by certain of our critics. One of them, an editorial writer on a Western contemporary, got a bit out of patience and ridiculed the fuss made about good clear English by claiming that all he and his friends wanted was "to get there"; by which it is to be supposed that he meant that his own unpretentious writing amply expressed his meaning and conveyed it without circumlocution to his readers. In this he is mistaken; slovenliness of speech and vulgarity of expression are things quite different from simplicity and directness. The latter we certainly want, but they are qualities not to be secured except by taking pains and acquiring a careful habit. At the final resort, the purpose of writing is to convey ideas; writing is the conveyance or vehicle of thought which bears the ideas of one man to another. It is obvious that the smoother the vehicle runs, the fewer obstructions or accidents to impede progress, the less delay in transit, the more successful the transfer. Our friend who thinks he can get there by careless vulgarisms and a disregard for what he considers needless niceties of speech, is like a man who sets out to reach his destination in a ramshackle wagon with worn tires and broken springs; he may get there, but the thoughts that he carries will be sick with fatigue when they reach the end of their journey. The more expenditure of brain tissue in deciphering the words and idioms of a sentence, the less energy is there available for the appreciation of the thought it embodies. Poor punctuation, unusual forms of spelling, involved clauses, unfamiliar words, and local terms, all detract from the force of the idea they convey, by diverting the attention and weakening the interest of the reader. Moreover, those that, of malice aforethought, prefer to use local terms and provincial idioms, are like the driver who, not content to be hindered by a poor vehicle, throws stones and digs holes in the road he intends to travel. Get there? my dear friend, you may get there, but the intellectual freight you carry will be useless pulp to the reader by the time your clumsy driving and poorer choice of road have borne your ideas to a weary world!

Of course, there is the other side to this simile. Some people there are who convey light merchandise in beautiful smooth-running vehicles; they have rubber-tired wheels, a gaudily painted wagon, a crackling whip and all the frippery of a horse-show; and in the end they deliver a small package neatly wrapped and prettily directed; but inside it is only sawdust. Some people have the ability for saying things far beyond anything worth the saying that they have to say. They are the people of whom Huxley said that you might almost mistake their insensate caterwauling for the music of the spheres.

The implication that coarseness means strength—and refinement, weakness—will not serve; nor is it advisable to make comparisons between the literary ways of an effete East and a virile West; there are too many Eastern men writing books and editing newspapers in the West and too many from the West doing similar useful work in the East, for the taunt to stick. And, if it be true of English as spoken in America, it ought to be more true of the language in which the technical literature of the English-speaking countries is written. The papers and books published at San Francisco, Denver and New York are read at Melbourne, Johannesburg and London, and *vice versa*. When the Australian talks of 'rich gold' and intends to name ore rich in gold; when the Africander speaks of '3,600-mesh' and means the square root of it; when the Californian writes of 'sulphuret' and implies sulphate, oxisulphate or some decomposition product, but really uses his localism as a synonym for 'sulphide'—in each of these cases there is bred a confusion of ideas which is destructive to technical literature and leaves its purveyors open to the charge of Barrie, who remarked that in this age the man of science appears to be the only one who has anything to say worth the saying, and is at the same time the one who knows least how to say it.

The Dissipation of Energy.

The hardest things to see are those that lie directly before us. A sadly humorous phase of this maxim is presented every sultry summer. The difference between body temperature and the coolness about us, that might be made available, is not a large margin to overcome, for the surrounding air rarely approaches the 98¼° of the normal blood; yet we carelessly neglect some conditions which might be easily adjusted to our physical comfort. Only one or two people in a hundred follow the simple device of having part of the windows open at the top. On suggesting the laws of the circulation of air as dependent on convection currents, some of our dazed neighbors respond that the screens only fit the bottom windows, as though a slight extension of the guide strips could not carry them to the top, or at least a bit of mosquito netting be tacked over the open top-apertures. A simple test will repay the most indifferent and will frequently transform stuffy rooms to a comfortable coolness. There are other illustrations of our test, the Subway, for instance. Many months ago this JOURNAL called the attention of the public to some latent fault in sampling the air in the subterranean stuffing-box; but, with the advent of hot weather, we are impressed with a ridiculous caloric blunder in tunnel engineering by those who had, and still have, the responsibility of ventilation. The old iron blast-furnace was a poor device for making producer gas, and only incidentally a wasteful and extravagant smelter of pig iron. So the motor system of the Subway is an admirable method of the electrical heating of a longitudinal tube, with the incidental result of moving the cars. That this phase of the thermal condition of the Subway should have been neglected by the engineers is an indictment of their education as scientific physicists. The conservation of energy is a factor in daily life. It will not sleep unnoticed in the dusty pages of a college textbook; it is the moving fact

which is back of all individual suffering and public protest. The New York subway is a local matter and may not, at first glance, seem to be a subject of vital interest to the readers of this cosmopolitan JOURNAL; but we venture the assertion that the Subway engineers might, profitably to their own reputation and the public comfort, have consulted some of the many mining engineers who have effected ventilation in difficult places, cheaply and successfully.

Market Conditions.

June 21.

The metal markets show a little more animation, especially when it is considered that the summer vacation season, when quiet is always expected, is now well on. Copper shows a little more inquiry both for home consumption and export. Tin has had about the usual fluctuations. Lead is quiet, but steady, while spelter is firmer than it has been.

Silver keeps at about a level, with fair buying from the East, but no special demand.

The iron markets still show a waiting disposition, to which there has been some response in lower prices for raw material. In finished lines there is little new, except a call for structural material, which is in more active demand than anything else just now.

In the West the coal markets show little change locally; but Lake trade is improving, with signs that the season will come fully up to an average year. In the East, the bituminous trade is on a steady level, with no special features. Anthracite trade is very good, for the season, and the large production seems to be well absorbed by purchasers.

With the Nernst terminal, for the electric lamp of that name, the potential difference across the glower is the same (at normal current) for direct or alternating current; but with the Hanks terminal, the potential difference of direct current may be 20 volts lower than with alternating current.

A promising field for the absorption of zinc is found in treating timbers, as railroad ties, with an absorbable solution of zinc salts, as a preservation against mold, fungus, and other forms of decay. *Bulletin* 51 of the United States Department of Agriculture records some of the results of timbers that were saturated and then subjected to the corrosive action of moisture, burying, and the like.

The New President of Lehigh University.

The Trustees of Lehigh University have unanimously elected Mr. Henry Sturgis Drinker to succeed the late Dr. Thomas M. Drown as president of that institution. This choice is supported with equal unanimity by the alumni, and will be heartily approved by all friends of the university.

Mr. Drinker graduated from the School of Mines at Lehigh University in 1871. He was one of the original eighteen who founded the American Institute of Mining Engineers at Wilkes-Barre in that year. After serving in the colliery department of the Lehigh Valley Railroad Company, he was transferred to the railway engineering department, and placed in charge of the Musconetcong tunnel, in New Jersey. In February, 1875, he read before the Institute an exceedingly able paper on this tunnel; and in 1878, as the result of his studies and practice in that line, he issued his great work, entitled 'Tunneling, Explosive Compounds and Rock Drills,' a second and enlarged edition of which appeared in 1882. Before this book appeared, however, Mr. Drinker had already finished a course in the study of law, and had been admitted to the Philadelphia bar. His knowledge of railroads, mines, etc., soon brought him into relations with the Lehigh Valley Coal Company as its general solicitor—a position which he has held for more than twenty years, under half a dozen successive administrations of the affairs of that corporation.

Mr. Drinker has long been a trustee of Lehigh University, and was one of the most ardent supporters and warmest personal friends of Dr. Drown. It is generally understood that he accepts this new position at considerable pecuniary sacrifice, but it cannot be said that he enters upon a wholly new occupation. He has never ceased to be warmly interested in his *Alma Mater* and its graduates, and his wide, varied and thorough training, both in science and in business, may fairly be regarded as a peculiar qualification for the work which he now undertakes. Lehigh University is to be heartily congratulated upon its new president.

R. W. R.

The old question of the action and influence of nitrogen in the iron-blast-furnace is again brought forward by Hjalmar Braune (in *Osterreichische Zeitschrift, Berg- und Hüttenwerke*) who emphasizes the dangerous nature of the gas as impairing the desirable qualities both of cast iron and its resulting steel products. In particular the writer shows the deterioration of crucible steel resulting from the substitution of Swedish pig by hot-blown American iron, the hot blast being apparently a medium for the occlusion of the destructive nitrogen compounds, as cyanides, and otherwise.

Canadian Mining Institute.

The secretary of the Canadian Mining Institute says, in the *Canadian Mining Review:* "We note with much satisfaction evidence of the establishment of more intimate and friendly relations between the Canadian Mining Institute and the Canadian Society of Civil Engineers, an arrangement having been recently concluded by which the Institute has been accommodated with most convenient and comfortable quarters in the Society's building, 877 Dorchester street, Montreal; and here, at any rate for the next twelve months, the Institute's secretary will take up his official abode, while the library, which is also to be housed in the same building, will be under his personal supervision. It is needless at the moment to more than casually allude to the antagonism which at one period existed between the two organizations, for, if it has not quite disappeared, it is certainly now high time that it should. At any rate the new arrangement may be regarded as a treaty of peace, the original *casus belli* being no longer a matter of practical politics.

"It may not be out of place, now we are on the subject, to add a word or two in explanation of the reasons which induced the Council to accept and act upon the disinterested suggestion made by Dr. J. Bonsall Porter, of McGill University, who, by the way, is an active member of both organizations, that negotiations with a view to this co-tenantry arrangement be opened with the Canadian Society of Civil Engineers. One of the several important considerations then was the desire to increase the value and utility of the library to the membership at large by a plan which would admit of the circulation of books. It was felt that the library had been of little value in the past to any but members actually resident at headquarters, and hence the proposal to place non-resident members on a better footing in this regard, by affording them the opportunity of borrowing such books or publications as the library contained, which met, generally, with much favor. The difficulty however, of carrying out this idea without injury to the library as a permanent collection, appeared somewhat formidable, but this quite vanishes when it is explained that the library of the Canadian Society of Civil Engineers, which members of the Institute have now permission to consult, for all practical purposes, duplicates that of the Institute, and consequently the reference value will always remain intact. In addition, the Institute shares the use of a capital lecture hall, and, what will appeal to many, a smoking and loungingroom, comfortably furnished and generously supplied with popular illustrated periodicals. The rooms, moreover, are within a minute or two's walk of the Windsor Hotel, where our friends visiting Montreal usually put up, and the building is open from 9 A. M. to 11 P. M.—which is long enough for anyone."

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

PYRITE SMELTING.

The Editor:

Sir—I realize that it is impossible to ever be able to say the last word on any technical subject, and this must be particularly so in regard to metallurgical operations. At the works of the Tennessee Copper Company we have made many experiments, and have much improved our practice in pyrite smelting, but we expect to do better still. Not until our enlarged plant is completed do we hope to get the full benefits of pyrite smelting, and, therefore, all that I can do for the profession is to report progress.

The month of May gave us the best results which we have attained since our change, but we still can see many points in which improvement is sure to come; in other words, we look forward to a somewhat ideal condition in which, instead of every kind of accident or setback every month, we will have only one kind each month. In May we smelted about 19,000 tons of ore in our three furnaces, together with 1,000 tons of custom matte. Including converter-slag and blast-furnace products and first matte resmelted, we handled a little over 30,000 tons of material per month, not including coke. The total coke burned for this 30,000 tons of material was about 1,500 tons, which is considerably higher than we should consume, partially on account of using some fine material from coke stock, and also on account of the extra coke used in smelting crusts.

Permit me to re-state briefly the principal features of the present Tennessee plant. It consists of three blast-furnaces, each 56 by 180 in. at tuyeres, the total height from tuyere to feed-floor being 18 ft. Of this, 14 feet are available for depth of charge, the top 4 feet being simply added so as to get proper distribution of the charge. Each furnace has 26 four-inch tuyeres, and the blast is furnished from piston blowing-engines. This blast-furnace is exactly the same one that was formerly used for smelting roasted ore, and we have not found the necessity of any marked change in pyrite smelting. Perhaps, here may be a good place to mention that the only change which it was found necessary to make in the furnace was the elimination of the old Boston & Montana type of cast-iron, brick-lined crucible, and its replacement by water-jackets and cast-iron sole-plate; so that the present furnace is practically water-jacketed all the way down.

Two furnaces are used for treating ore that comes from the mines; the third furnace concentrates the matte from these two furnaces.

The Tennessee Copper Company has three mines, of which, at present, only two are being wrought—the Burra Burra and the London. The Polk County mine will not be put in commission again until the beginning of next year, when the enlarged plant will be in operation.

The ore is a massive sulphide, consisting of nearly equal parts of pyrite and pyrrhotite, together with a certain proportion of chalcopyrite and silicious minerals. Below are approximate analyses of the Burra Burra and London ores:

	Burra Burra.	London.
Copper	2.2%	3.0%
Sulphur	30.0 "	21.0 "
Iron	37.5 "	31.0 "
Zinc	2.0 "	0.8 "
Lime	6.2 "	6.1 "
Magnesia	1.9 "	2.5 "
Alumina	3.9 "	4.4 "
Silica	10.3 "	26.3 "

The ore, as it comes from the mine, is crushed coarsely, so that the maximum size does not exceed six inches. It is then sent to the smelter bins, where it is fed into the charge-cars. The ore from each mine is kept separate on account of the different silica content, the ordinary charges being as follows:

	Burra Burra.	London.
Ore	4,000 lb.	5,000 lb.
Quartz	1,000 "	400 "
Coke	120 "	150 "

These proportions are not always adhered to, the amount of quartz and the amount of coke being varied to suit conditions of the furnace and the grade of the matte. In loading the charge-cars, the sulphide ore is placed underneath the quartz; a train generally consists of four cars of ore charge and one car containing either 480 or 600 lb. coke. The coke is not dumped into the furnace, but is thrown on the opposite side of the track upon the feed-floor. The charge-cars dump into the furnace, two on each side. Practice at our plant (like that at Mt. Lyell) shows that it is advisable to get the quartz near the center of the furnace, and this is best accomplished by putting it on top of the ore charge. On the contrary, it is found advisable to keep the coke as near the edges and corners of the furnace as possible, and it is fed by hand. As far as we are able to judge, in our charge the coke performs no distinct metallurgical function, but seems a necessary evil which must be endured in order to prevent crusts adhering to the jackets. This crusting of the furnace is the *bête noir* of pyrite smelting, and it is only by careful manipulation that it can be avoided. The furnace must be carefully watched, and, on the first sign of approaching crust, either it is removed with long bars, or else large chunks of sulphide ore are thrown against this crust to prevent its increasing in size.

If the coke is dumped into the furnace and not fed against the jackets, it will also tend toward increasing the crust. We have found repeatedly that a one-night's run (where the furnace crew was short and the coke could not be properly shoveled in) would suffice to crust the furnace so badly that it would take three or four days of careful manipulation to bring it around into good shape. We had a great deal of trouble in this respect during the last six months, not only on account of shortage of labor, but also by reason of the fact that we lost the use of the 'loop' track around the furnaces during the enlargement of the smelter building.

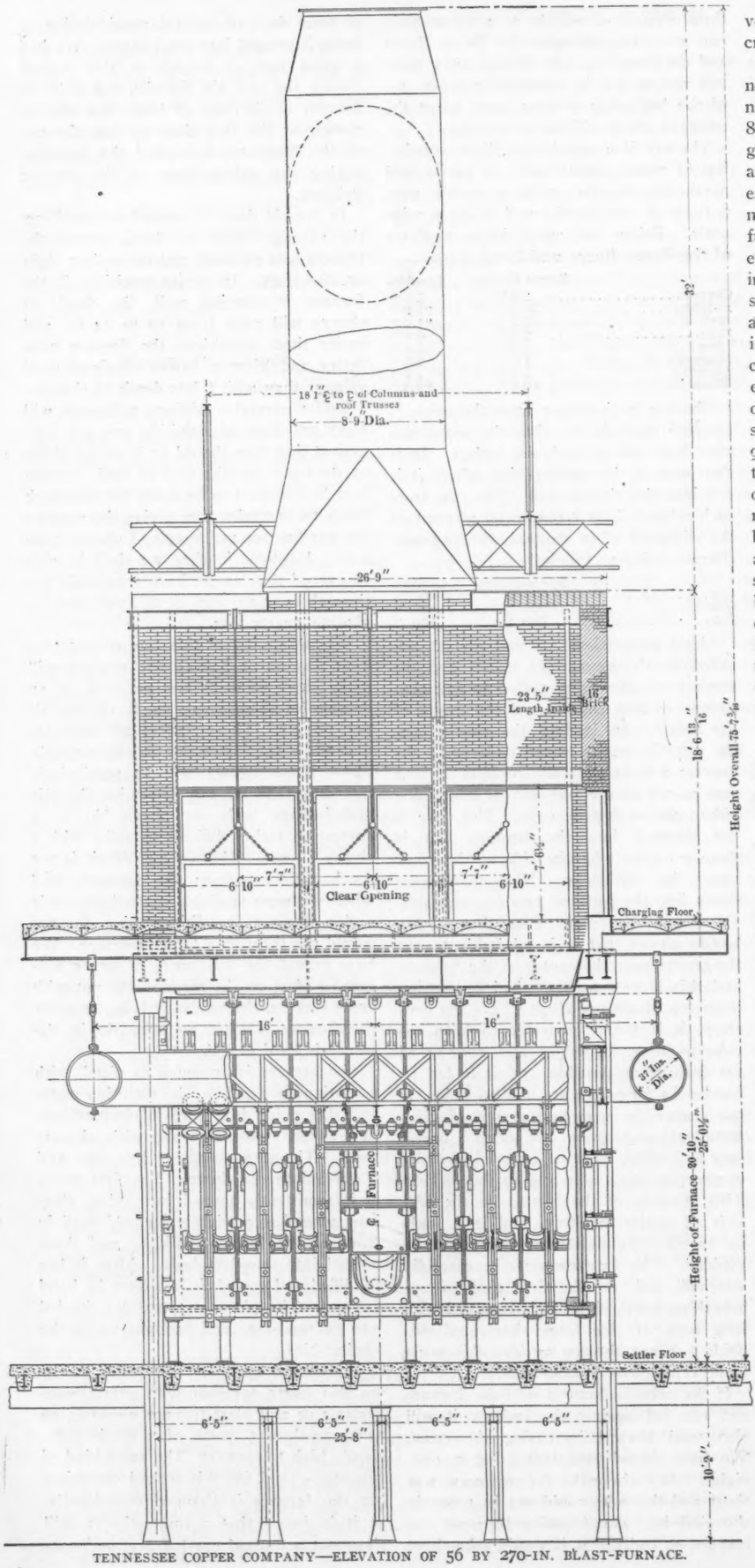
In the old days of roasted-ore smelting, the average depth of charge above the tuyeres was probably not more than eight or nine feet. In pyrite smelting, if the furnace is running well, the depth of charge will vary from 12 to 14 ft., and under these conditions the furnace runs better and gives a better elimination of sulphur than with a less depth of charge.

Under normal conditions, a furnace will treat 375 tons of sulphide ore per day, and, at that rate, should be in action about 27 days per month; that is, each furnace may be expected to be down for one week every two months, thus giving the average ore per furnace per month of about 10,000 tons. I believe in time we shall be able to exceed this, as we have frequently put through over 400 tons in 24 hours, not including quartz flux.

When running at this rate of 375 tons (per day of 24 hours) our engines will make about 68 to 75 rev. per min., or an average of about 17,000 cu. ft. of free air per minute. These figures are accurate and allow for losses due to slip or leakage. These figures will be particularly interesting, as we can determine the slip and leakage with our piston blower—a correction rather difficult to make with a rotary blower. This volume of air is not much different from the amount used when we were smelting roasted ore, only under former conditions the furnace would put through a larger tonnage. We have repeatedly tried using a larger volume of blast on the furnace, but not with great success, the tendency being to crust the furnace. What we may do in the future is hard to tell.

The furnace is arranged as usual, with a continuous overflow, the resulting matte and slag going into a 16-ft. circular 'settler,' which we now line with chrome brick. The slag overflows into cars and is carried to the dump. The first matte is intermittently tapped into other slag-cars, moved to a slightly inclined yard in front of the furnace building and there poured into flue-dust beds. After it has solidified and cooled, it is broken by hand (as near 6-in. pieces as possible), loaded into railroad-cars and brought up to the smelter-bins.

The second operation consists in smelting this matte, together with quartz, converter-slag and blast-furnace cleaning, so as to produce a matte of a grade sufficiently high to convert. The same kind of furnace is used for this second operation, but the furnace is changed occasionally, as it is found that a matte-charge will clean out a crusted ore-furnace, and con-



TENNESSEE COPPER COMPANY—ELEVATION OF 56 BY 270-IN. BLAST-FURNACE.

versely an ore-charge will clear out a crusted matte-furnace.

The matte-concentrating furnace does not run as rapidly as the green-ore furnace, the tonnage per week varying from 800 to 1,300 ton of matte, depending a great deal upon the grade of the matte and the condition of the furnace. In the early days of our pyrite smelting we found no great difficulty in running an old-type furnace on a green-ore charge; but, whenever we attempted a concentration charge, in less than 24 hours the crucible became so hot that it leaked in every direction, and it became impossible to keep the matte in it. One by one the crucibles were changed by the substitution of 'baby jackets,' the first furnace changed being put on concentration charge (such as I will show herewith), running from December 9 to 15, 1904. I also give the average of the matte produced on the first and second operation, respectively, during the month of May, that on the first operation being about 12% and that on the second about 43%. This grade of matte on the second operation is somewhat complicated by the addition to this charge of 45% custom matte, which is simply re-melted in this furnace, and then converted. It tends to mask the real operation, though we assume that it has no particular effect upon the concentration.

MATTE ANALYSES.

	First.	Second.
Copper	11.9%	42.8%
Sulphur	25.6 "	24.6 "
Iron	54.0 "	29.2 "
Zinc	1.7 "	1.0 "

It will be remembered that the slag which we produced in ordinary roasted-ore smelting ran about 33% to 35% silica. It is not yet found possible to do this in pyrite smelting. The fact seems to be, as has been before stated, that, with a given ore and a given furnace, the combination makes its own type of slag, from which it is impossible to make any radical changes. Therefore we have, so far, arrived at the fact that the slag at our first operation will run about 40% silica. It makes no difference whether we increase, or diminish, the amount of quartz on the charge; the slag will remain at about 40% silica, and the only change will be an increase, or decrease, in the grade of the matte. In fact, the method of running the furnace is to vary the quartz charge so as to keep a constant grade of matte. This grade varies from 9% to 16%, and, under present conditions, we consider a 12% matte the most economical. While making this grade of matte, the slag will run from 0.18% to 0.27% copper. Herewith I give analyses of our slag on both the first and second operations:

SLAG ANALYSES.

	First.	Second.
Copper	0.2%	0.6%
Sulphur	0.7 "	1.3 "
Iron oxide	42.5 "	52.6 "
Zinc oxide	1.5 "	1.1 "
Lime	7.5 "	2.6 "
Magnesia	2.0 "	0.7 "
Alumina	5.5 "	4.2 "
Silica	40.0 "	36.5 "

It will be observed, from these analyses,

that, on the first operation, we make about a 'quarter' slag, the factor of which is 0.259. We notice, however, that the silica is much higher than the ordinary 'quarter' slag such as a lead furnace will make; but, as I have said before, it is absolutely impossible for us to keep this silica down. I have no doubt that it is because of this 'quarter' slag that our copper runs so low on the first operation. A straight charge of Burra Burra ore will give a better ratio than a London charge, or even a mixture of the two. We did make an experimental run for about two days, adding some barren limestone to the charge so as to make the formula an exact 'quarter' slag, but the campaign was so short that we were not able to see any improvement in the slag-losses.

In the first concentration, carried out in December, 1904, we took low-grade matte from our first green-ore smelting, which probably did not run higher than 9% copper, and in one operation brought it up to 50%. Under these conditions we made practically an iron-silica slag, with a specific gravity of about 3.8. Under these conditions the slag ran high in copper. The results of runs for two different weeks in December, 1904, are given herewith, simply to show what can be expected with concentration of this kind. In this operation we found no difficulty in making matte of any grade desired, simply by varying the amount of quartz; and, as we had a large accumulation of low-grade matte, we thought it better policy to concentrate highly so as to get a maximum output from the converters. We soon found that these concentration losses could be reduced by adding a certain amount of sulphide ore to the charge. This not only decreased the rate of concentration, but also improved the composition of the slag by adding to it a certain proportion of other bases. This improvement in composition can be seen by looking at the complete analyses of slag, as given herewith.

For comparison, I give the results of three different week-runs on concentration, the first two being straight, and the last one showing about the type which we now follow (see table top of next column).

We still have on hand an accumulation of custom matte, which we are trying to clean up; and, as soon as this is out of the way, it is our intention to add barren limestone to this concentration charge so as to make a 'quarter' slag and determine,

TYPICAL CONCENTRATION RUNS.

	Dec. 9 to 15. 1904. Tons.	Dec. 16 to 22. 1904. Tons.	Jan. 2 to 8. 1905. Tons.
Sulphide ore	.....	.....	279
Converter slag	130	210	162
Blast-furnace slag	.....	.....	320
Quartz flux	562	527	307
Custom matte, 45%	....	.....	252
First matte, 10% to 12%	1,296	1,285	808
Total	1,988	2,022	2,118
	Tons.	Tons.	Tons.
Coke used	89	71	151
Coke percentage	4.5	3.5	7.1
SLAG ANALYSES.			
Copper	1.01%	1.03%	0.65%
Iron oxide	58.6%	58.4%	54.2%
Silica	33.9%	34.2%	38.8%
MATTE PRODUCED.			
Copper	48.2%	52.5%	44.2%

experimentally, whether we can concentrate 13% matte to a 40% matte with comparatively low slag-losses. As far as I am aware, this particular kind of work has not been carried out anywhere else in the United States, and it will be interesting to see what results are achieved. In certain of the Salt Lake valley smelters a concentration of low-grade matte is made, in which the silicious material added is usually an ore containing more or less iron, and also considerable fine; and, as a rule to this charge some limestone is added. Under these conditions it is difficult to get more than a concentration of 3 into 2, or 2 into 1, at the utmost. I am not prepared to say whether in our case there would be any commercial gain in adding limestone, as unquestionably more quartz would have to be used; and, as both quartz and lime cost money and it takes money to smelt them, it is a question of balancing the copper saving as against the added cost of the flux. As I have before stated, mechanical difficulties (due to the inexperience of our men and also to the interference incidental to the enlargement of our plant) have, to a large degree, made our operation irregular.

I give herewith the results on a fairly average week's run in which two furnaces were smelting straight sulphide ore and the third furnace was treating matte (from the first operation and also custom matte). The amount of matte concentrated was not equal to that produced in the first operation. The figures are only given to show about how the furnace tonnage ran. The plant, as at present constituted, is not properly balanced, and it is our intention, when more furnaces are available, to treat the converter-slag with the green ore, so as to reduce its copper content as much as possible. Under present conditions it is treated in the concentration furnace, and so, when finally discharged, it carries at least 0.6% copper.

WEEKLY TONNAGE.

Furnace.	No. 1. Tons.	No. 2 Tons.	No. 3. Tons.	Total Tons.
Sulphide ore	2,667	2,540	253	5,406
Converter slag	.....	.....	721	721
Quartz flux	559	456	220	1,235
Custom matte, 45%	.....	.....	231	231
First matte, 12%	.....	20	557	577
Total charge	3,226	3,016	1,982	8,224
	Tons.	Tons.	Tons.	Tons.
Coke used	92	99	174	365
Coke percentage	2.9	3.3	8.8	4.4
Tons of charge per day.	461	431	283	

It is almost unnecessary to state that, in all of our work, we have used nothing but cold blast; and, thus far, the use of hot blast in treating a heavy sulphide ore like ours has not, as far as I can see, been of any advantage. At Mt. Lyell it was formerly supposed that it was necessary; but, after four years' practice, the use of it has been finally abandoned. At the plant of our neighbors, the Ducktown Sulphur, Copper & Iron Company, Mr. Freeland put in a U-pipe hot-blast stove, but could find no improvement either metallurgically or commercially therefrom, either on roasted or unroasted ore. He, therefore, for the present has abandoned any further attempt to utilize hot blast.

In the issue of this JOURNAL for June 8, 1905, two references are made to hot blast, and both of them seem to agree that cold blast is an aid to concentration. The fact is, my colleagues and I believe the time is not distant when we, perhaps, will be able to make from our ore, on one operation, a matte that can be directly converted. At the Ducktown Sulphur, Copper & Iron Company's plant the furnaces have occasionally produced high-grade matte for 24 hours at a time; yet, so far, they have not been able to keep up this concentration and at the same time maintain the capacity of the furnaces.

The accompanying table, giving the composition of our matte, may prove interesting, particularly as it shows that the amount of sulphur present is considerably less than that which would be expected (from an accepted formula for matte, Cu_2S,FeS). For a time we thought that we had an excess of iron in our matte, but we finally found that the actual iron very nearly agreed with the theoretical, the only difference being that a certain amount of the sulphur was replaced by

SP. G. OF SLAGS AND MATTES.

COMPARISON OF MATTE HELD IN SUSPENSION IN SLAG WITH SP. G., ASSUMING THAT THE COPPER IN THE SLAG IS IN THE FORM OF PARTICLES OF MATTE.

SAMPLE	Cu.	SiO_2	Fe	Fe O	Al_2O_3	Ca O	Mg O	S	Zn	Zn O	Mn	Mn O	Sp. G.	Gms. of Matte in 1 gm. of Slag
Fur. No. 3, December, 1904.....Slag	0.86	33.16	.....	57.42	1.92	1.42	0.63	2.15	.....	1.96	.....	0.46	3.836	0.0187
Fur. No. 3, December, 1904....Matte	45.78	.....	25.93	.....	.....	.....	.....	24.51	2.09	.....	0.14	.....	5.003	.....
Fur. No. 1, December, 1904.....Slag	0.27	36.35	.....	44.54	4.10	7.90	1.99	1.67	.....	2.66	.....	0.64	3.568	0.0232
Fur. No. 1, December, 1904....Matte	11.62	.....	53.80	.....	.....	.....	.....	25.12	2.77	.....	0.32	.....	4.802	.....
Fur. No. 1, September, 1904.....Slag	0.21	37.18	.....	42.73	4.96	8.71	2.11	1.32	.....	2.30	.....	0.41	3.514	0.0205
Fur. No. 1, September, 1904...Matte	10.24	.....	53.90	.....	.....	.....	.....	25.41	1.66	.....	0.43	.....	4.820	.....
Fur. No. 1, February, 1905.....Slag	0.37	39.06	.....	45.67	4.14	6.04	1.62	1.52	.....	1.44	.....	0.40	3.383	0.0158
Fur. No. 1, February, 1905....Matte	23.43	.....	43.70	.....	.....	.....	.....	26.52	1.48	.....	0.15	.....	4.900	.....
Salt Lake Valley Slag	0.24	42.35	.....	30.66	3.02	20.38	1.23	0.67	.....	0.93	.....	0.24	3.215	0.0120
Salt Lake Valley Matte	20.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

oxygen, presumably part of the iron being FeS and the other part Fe_3O_4.

We hope that the time will come when the barring of furnaces will be reduced to a minimum. At present, if a furnace gets in such bad shape as to be pretty well crusted on top, we allow the furnace to run down, adding several charges of slag and coke. The blowing engine is then reduced in speed, so that it delivers very little air to the furnace, and long 1½-in. steel bars, with chisel-shaped ends, made of 2 by 4 in. steel, are driven down behind the crusts. A chain is slipped over the bar and attached to one of the electric locomotives, which slowly pulls it and the crusts over into the furnace. This is a vast improvement on the former method of attempting to attack these crusts with small bars and by hand alone.

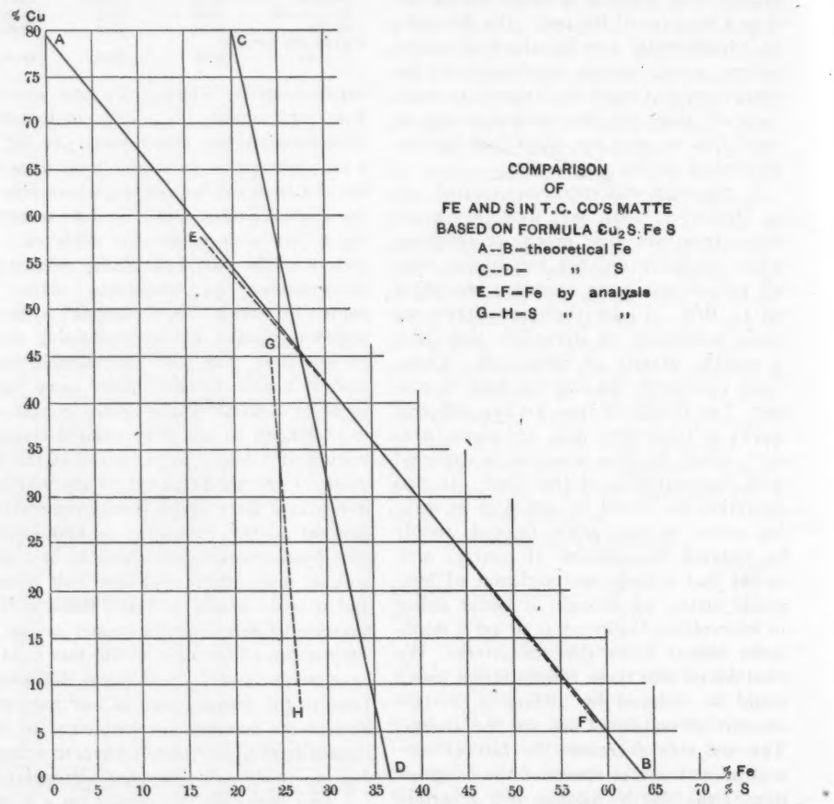
The addition to the blast-furnace plant will consist of four furnaces, 56 by 270 in. at the tuyeres, but of the same height and general shape as the old furnaces, excepting that the lower jackets will be carried down to the sole-plate. These furnaces will have rounded corners, so as to facilitate barring, and the number of tuyeres will be increased to 26 on the rear side of the furnace and 24 on the front side, each tuyere being of about 3-in. diameter. We are of the opinion that a large number of tuyeres, more closely spaced, will give us better results. In other words, each tuyere is a nucleus of activity; so that, if carried to its logical extreme, a narrow slot would be the ideal opening for the air blast. This, of course, is an impossible construction. The tops of the furnaces will be so modified that, in case it becomes necessary to do any heavy barring, extra doors above the feed-doors will be thrown open and bars held vertically will be driven by men on a platform above the feed-floor. Each furnace will be supplied with air by a horizontal piston blowing-engine, capable of delivering 30,000 cu. ft. free air per minute. Only three of these new engines will be provided, as it is estimated that in the final plant, which will consist of seven furnaces and six blowing-engines, one furnace will always be out of blast.

It is still a little too early to determine exactly what the commercial saving will be on pyrite smelting. We have certainly eliminated the roast-yard expense, which amounts to 40c. per ton. I believe that the blast-furnace expense per ton of green ore will be about the same; and I am of the opinion that we will save at least four pounds more of copper than we did in the old method. In addition to this, much to our gratification, we have found that the gases from the furnace are so rich in SO_2 that we can make acid from them by the chamber process. This will give us a by-product, which will be of great value in the South for the purpose of making fertilizers, and not only will it operate toward reducing the volume of gases given to the atmosphere, but will prove a source of considerable revenue. We are, however, providing the new plant with a stack 325 ft. high (internal diameter 20 ft.), so as to give us perfect draft, which is desirable in pyrite smelting, as without proper draft, and with gases leaking from the doors, the feed-floor is by no means a comfortable place.

I regret that I am not in a position to say that we have absolutely settled everything to our satisfaction. Perhaps it is well that such is the case, for all industries either advance or recede; they never stand still.

J. Parke Channing.

New York, June 12, 1905.



German Steel Production.

The corrected report of the German Iron & Steel Union gives the production of steel in Germany for the full year as below, in metric tons:

	Acid.	Basic.	Total.
Converter ingots...	423,742	5,525,429	4,949,171
Open-hearth ingots.	130,546	2,697,760	2,828,306
Direct castings.....	56,409	96,405	152,814
Total.....	610,697	8,319,594	8,930,291
Total 1903.....	613,399	8,188,116	8,801,515

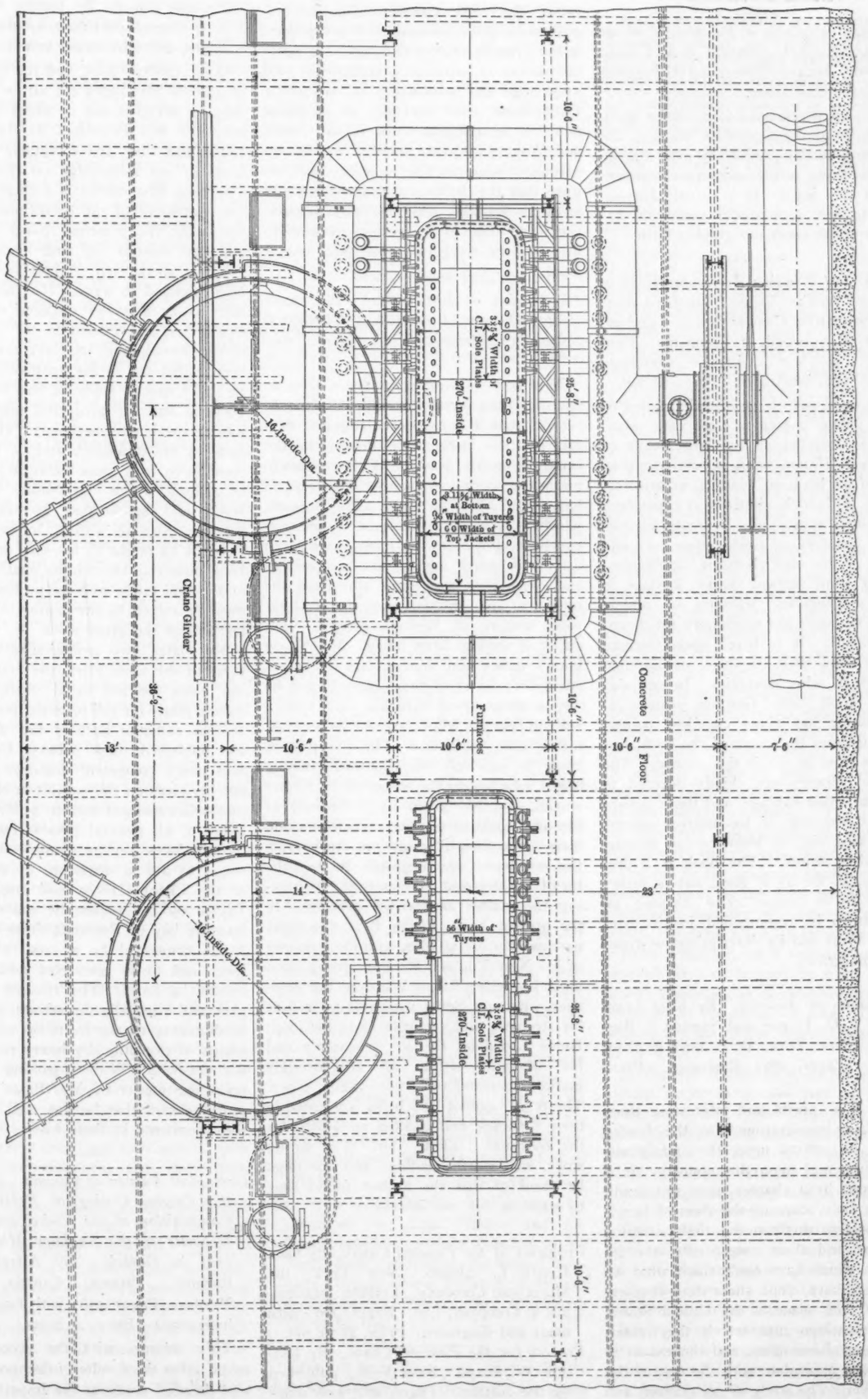
The total production last year showed an increase of 128,776, or 1.5%, over the previous year. It will be noted that 93.2% of the total was basic steel; and that 55.4% was made in the converter.

The Welsbach lamp uses a mantle composed of 99 per cent thorium oxide with a small quantity of cerium oxide.

The late Baron Rothschild gave sound advice in the following rules for conduct, which he used to circulate among the young men of France: Shun liquor; dare to go forward; never be discouraged; be polite to everybody; employ your time well; never tell business lies; pay your debts promptly; be prompt in everything; bear all troubles patiently; do not reckon upon chances; make no useless acquaintances; be brave in the struggle of life; maintain your integrity as a sacred thing; never appear to be something more than you are; take time to consider, then decide positively; carefully examine into every detail of your business.

The Nernst lamp uses a filament composed of 85 per cent zirconium oxide and 15 per cent of yttria earths.

Regarding gas pressures and the French Ministry regulations therefor, *Revue Industrielle* notes the following, regarding the requisite strength of the gas-holders. Liquefied anhydrous sulphur dioxide, pressure-test 30 kg. per sq. cm., if enclosed in forged iron or mild steel; 15 kg. per sq. cm. if in copper. Oxygen, hydrogen, oil-gas illuminant, etc. (when above 15 kg. per sq. cm.), pressure-test, once and a half that of the contained gas, below 200 kg. per sq. cm.; and twice the pressure of the contained gas between 200 and 400 kg. per sq. cm.—a limit which should not be passed. Acetylene dissolved in acetone exerting a pressure of 10 kg. or more per sq. cm. calls for a container test of 60 kg. per square centimeter.



TENNESSEE COPPER COMPANY—PLAN OF 56 BY 270-IN. BLAST-FURNACE.

Books Reviewed.

Geological Map of a Portion of West Texas. By B. F. Hill and J. A. Udden. Austin, Texas; University Geological Survey. One sheet.

This map gives, on a fairly large scale, the results of the field-work done by the University Geological Survey over a large and interesting section of the western portion of the State. It is a valuable addition to that part of our geological literature which takes the graphic form.

Haulage and Winding Appliances Used in Mines. By Carl Volk. Translated from the German by Charles Salter. London; Scott, Greenwood & Company. New York; D. Van Nostrand Company. Pages, 152; illustrated. Price, $4, net.

This book, which is intended for students, young engineers and mine managers, is founded on the large work of Julius von Hauer, being a brief compendium of his book on winding, or hoisting, engines, with such additions as experience in teaching suggested. It treats, in successive chapters, of ropes; mine cars and tracks; cages and hoisting appliances; hoisting from vertical shafts; haulage in levels and inclines; working of underground engines; and machinery for downhill haulage. It is based upon German practice, and there is little, or nothing, on work in other countries. In one way this is good, since German practice in coal mining has many excellent points; but it narrows the scope of the book, and detracts from its use in this country. The haulage chapters are chiefly devoted to rope and chain haulage, and there is very little on the use of locomotives—steam, compressed air, or electric—for moving material in mines. The book is a useful one, as far as it goes, but is rather limited in its scope. The chapter on ropes is to be commended for its condensed form and its descriptions of ropes and connections.

The Italian in America. By Eliot Lord, John J. D. Trenor and Samuel J. Barrows. New York; B. F. Buck & Company. Pages, 276; illustrated. Price, $1.50.

This is a careful and interesting study of Italian immigration into the United States, its effects upon the immigrants themselves and upon this country. It is introduced by a chapter upon the conditions in Italy, showing the class of people who come to this country, their situation at home and their antecedents—the influences which have made them what we find them here. The succeeding chapters treat of their place in the United States, the occupations into which they enter, their general condition, and the extent to which they assimilate with the rest of the population. The study of occupations and conditions—one chapter of which is devoted to the Italian as a miner—is an interesting one. The authors regret the disposition of these immigrants to congregate in the large Eastern cities, and to segregate themselves in separate communities; and they urge the advantages of scattering them more, and especially of engaging them in agricultural work in the South and West. They are inclined to take an optimistic view of the situation, and believe that the Italians will prove, on the whole, a desirable addition to our population; and that, in the second generation, they will be freely absorbed and assimilated.

The Vision of Elijah Berl. By Frank Lewis Nason. Boston; Little, Brown & Company. Pages, 298; illustrated. Price, $1.50.

This book is another evidence that an engineer must have imagination to be successful; but it is not every engineer who can put his imaginative faculty to the same use as Mr. Nason. Without ceasing his active work as a mining engineer, he has found time to write a third book, which is a worthy successor to the two excellent stories he had previously given us. It is worth noting that his training and experience have kept him from the mistakes and discrepancies into which most writers of Western stories, especially of mining, have fallen. Mr. Nason knows mines and miners, and he knows engineers; he is of them himself and he writes about them naturally and with a realism that his fellows cannot help recognizing and applauding. In the present book he has left the Colorado mining towns, which were the scenes of his former stories, and has given us a romance of the arid lands of southern California and their redemption by irrigation. Apart from the realism of the engineer, he has the faculty of drawing character, and of making the reader realize his persons. In the present book, Elijah Berl, the hard, narrow man of one idea, with the influence of his New England training strong upon him; his wife; Ralph Winston, the engineer, who sees Berl's weakness as well as his strength, and yet believes in his idea; Helen Lonsdale; the old sea-captain and his scheming sister; all are strongly marked personalities, not vague types. The reader cannot help being interested in their fortunes, and looking anxiously for the outcome. 'Elijah Berl' is a strong story, well worth reading; and one must be thankful that the author found time to write it, for our benefit.

Problems of the Panama Canal. By Gen. Henry L. Abbott. New York; the Macmillan Company. London; Macmillan & Company, Ltd. Pages, 200; with maps and diagrams. Price, $1.50, net.

Project for the Panama Canal. By Lindon W. Bates. New York; published by the Author. Pages, 28; with maps and profiles.

Project of Terminal Harbors for the Panama Canal. By Lindon W. Bates. New York; published by the Author. Pages, 28; with maps and illustrations.

Gen. Abbott's book and the two monographs by Mr. Bates are all on the same subject, which is one in which we are all more or less interested at the present time; and they are acceptable contributions to our knowledge on that subject. The book first named is a clear and concise statement of the conditions affecting the canal, the principal plans proposed, and the reasons for and against them. On this work Gen. Abbott is especially well qualified to write. His long experience as an engineer engaged in, and in charge of, the execution of important public works, and the fact that he has been called on, in his professional work, to make special study of the Isthmus of Panama and the projected canal, enable him to speak with authority. He has the facts at his command, and he has given them fully, with some technical detail, but in a form which can readily be understood and appreciated by the general reader. Anyone who is interested—and most of us ought to be—can find in this book material enough to enable him to understand fairly well the problems which must be solved by the engineers and contractors of the great work.

Mr. Bates' two monographs are really parts of the same work, the first suggesting plans for the canal itself, and the second plans for the terminal ports, which are an essential part of the work. He has published them because he believes that every competent engineer ought to put his ideas on the subject at the service of the Government and the public. Briefly outlined, his general plan is the creation of two lakes, one near the Atlantic terminal to aid in disposing of the waters of the Chagres river, and one near the Pacific end, to gather the waters flowing into the bay of Panama; these two lakes to be connected by a canal above sea-level, and to be connected with the two oceans by locks. The reasons for this plan, and especially the advantages gained in disposing of the overflow waters in a region of exceptionally heavy rainfall, are well set forth. Without passing judgment upon the merits of Mr. Bates' plans, it must be said that he has well presented the arguments in their favor.

Geological Survey of Canada. Report on the Origin, Geological Relations and Composition of the Nickel and Copper Deposits of the Sudbury Mining District in Ontario. By Alfred Ernest Barlow. Ottawa, Canada: Public Printer. Pages, 236; with maps and illustrations. Price, 25 cents.

This volume, with the accompanying maps, gives the results of the most careful and detailed study of the important Sudbury region which has yet been made. It

includes also brief references to the character and extent of all the more important nickel deposits of the world, with a general statement of their production and methods of smelting and refining. Details of the mining, smelting and refining operations of the Sudbury ores are furnished, as well as complete statistical tables of production, prices, uses and composition of the nickel of commerce. It is believed that the report will serve to bring together, in one volume, all of the more valuable and critical original investigations in regard to these immense and apparently inexhaustible deposits. Canada has at last realized the true importance and value of these mines and has, within the last year, taken her position, from which she will not recede, of being the largest producer of nickel in the world. The volume is, therefore, of interest to all who are concerned in any way in the nickel industry.

Geologically, Dr. Barlow makes the succession as follows:

1. Lower Huronian.—No rocks of this age are at present known in the nickel-bearing area, but this period is represented, in part, by the banded silicious magnetites and associated rocks of the townships of Hutton and Wissner.

2. Upper Huronian.—(A) Diorites, hornblende-porphyrites, and green schists; (B) conglomerates, graywackes, and quartzites; (C) norite and diorite (Worthington mine belt, and areas southeast of Evans mine and east of Sudbury).

3. Laurentian.—Granite and diorite-gneiss near Wahnapitae station.

4. Upper-Huronian (?).—Tuffs, feldspathic sandstones, and slates classified provisionally on previous geological maps as of Cambrian age.

5. Post-Huronian.—(A) Granites; (B) nickel-bearing eruptive of the main belt (quartz-hypersthene-gabbro or norite, diorite, with their peculiar differentiation product, micropegmatite); (C) dykes of olivine diabase.

On the accompanying maps the rocks are separated lithologically and are all bracketed under the general heading 'Archean.' All of these terms are used in the sense commonly given them by the Canadian Geological Survey. The district is closely related with the Lake Superior region on the west, and it is to be regretted that the Canadian and the United States surveys could not have agreed upon uniform nomenclature, and thus have saved some confusion.

As to the ore deposits, the conclusion drawn is that the norite is the original source of the nickel sulphides. There is also evidence of re-distribution by aqueous and gaseous solutions, accompanying later stages of the norite eruption. The relative importance to be given to such re-distribution is the point most in question among those who have studied the ore deposits of the district. Dr. Barlow agrees in most points with the valuable study of the region made by Dr. A. P. Coleman for the Ontario Bureau of Mines, though there is some difference on details, and on the emphasis to be placed on certain points.

It is not to be supposed that this monograph is the last word on the Sudbury region and its nickel deposits; but it is certainly a valuable addition to geological literature, and a clear exposition of the existing knowledge of a region which possesses many points of great interest to the investigator.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Tables and Other Data for Engineers and Business Men. Compiled by Chas. E. Ferris. Knoxville, Tenn.; University Press. Pocket size, 240 pages. Price, 50 cents.

Modern Machinery for Excavating and Dredging. By A. W. Robinson. New York; reprinted from the *Engineering Magazine*. Pamphlet, 36 pages; illustrated.

The Hydraulic Dredge "J. Israel Tarte." By A. W. Robinson. Montreal; reprinted from *Transactions* of the Canadian Society of Civil Engineers. Pamphlet, 20 pages; illustrated.

Geologic Atlas of the United States. No. 121. Waynesburg Folio, Pennsylvania. Washington; Engraved and Printed by the United States Geological Survey. Six maps and 14 pages text.

United States Geological Survey. Bulletin No. 243. Cement Materials and Industry of the United States. By Edwin C. Eckel. Washington; Government Printing Office. Pages, 392; with maps.

United States Geological Survey Water Supply and Irrigation Paper No. 126. Prepared, under direction of F. H. Newell, by N. C. Grover and John C. Hoyt. Washington; Government Printing Office. Pages, 128; illustrated.

The Mount Lyell Mining Field, Tasmania. With Some Account of the Geology of Other Pyritic Orebodies. By J. W. Gregory. Melbourne, Victoria; the Australasian Institute of Mining Engineers. Pages, 180; with maps and illustrations.

The New Knowledge. A Popular Account of the New Physics and the New Chemistry in their Relation to the New Theory of Matter. By Robert Kennedy Duncan. New York; A. S. Barnes & Company. Pages, 280; illustrated. Price, $2, net.

In the Nernst lamp, one chief difficulty was the tendency of the porcelain globe itself to conduct electricity.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Grahamite.—Can you give me any information as to grahamite; its uses and occurrence?—W. I.

Answer.—Grahamite is a hydrocarbon compound, very similar to ozokerite, albertite, elaterite, gilsonite, and similar bituminous minerals. Merrill's 'Non-Metallic Minerals' gives the following particulars: "Grahamite is a hydrocarbon compound closely related to albertite, but differing physically in having a duller luster and more coke-like aspect. It has been described by Dr. Henry Wurtz as occurring in shrinkage fissures whose course is N. 76° to 80° E. in carboniferous shales and sandstones, on a branch of Hughes river, Ritchie county, West Virginia. It is completely soluble in chloroform and carbon disulphide, nearly so in turpentine, and particularly so in naphtha and benzine, but not at all in alcohol. Melts somewhat imperfectly, beginning to smoke and soften like coking coal at a temperature of about 400° F. As occurring in the vein, the material shows four distinct, though somewhat irregular, divisional planes, having a general parallelism with the walls. Next to the walls the structure of the mineral is coarsely granular, with an irregular cuboidal jointed cleavage, very lustrous on the cleavage surfaces. The material in immediate contact with the walls usually adheres thereto very tenaciously, as if fused fast to the granular sandstone. The general aspect of the mass has led to the conclusion that the vein here is a fissure which has been filled by an extension, in a pasty condition, of a resinoid substance derived from or formed by some organic matter contained in deep-seated strata intersected by the fissure or dike. The density of a mass of the mineral was found to be 1.145."

A deposit of this kind, to be of value, should occur in masses free as possible from sand and other impurities. Like gilsonite and similar compounds, it is used for making varnish, for water-proofing, as an insulating material, and as a cement for roofing and paving compounds.

Out of a total of 67,000 safety lamps employed by miners in the Midland district of England over 40,000 are of one type—the Marsaut. The next most popular pattern is that known as the Bonneted Clanny. For locking purposes the lead rivet is most generally used, over 31,000 being secured in this way, and over 22,000 are locked by a screw. The magnetic spring is employed in about 13,000 lamps.

Recent Legal Decisions.

SPECIALLY REPORTED.

DUTY ON STEEL WOOL.—1. So-called steel wool, made from steel wire by a process which results in the destruction of the wire and would make it impossible for the customs authorities to determine the gauge of the wire used, is not within paragraph 137, tariff act of 1897, providing that articles manufactured from steel wire shall pay "the rate of duty imposed upon the wire used in the manufacture of such articles."

2. So-called steel wool, consisting of an article manufactured from wire, is within the provision in paragraph 135, tariff act of 1897, for "steel in all forms and shapes," and is thereby removed from paragraph 193, relating to articles composed of steel, "not specially provided for."—Appeal of Buehne from Board of General Appraisers; United States Circuit Court, Southern District of New York.

OREGON LAW ON EXPLOSIVES.—A new law has just gone into effect in Oregon which is of great interest to the powder and fuse manufacturers of other States. The general provisions are as follows: All blasting powder and fuse shipped into Oregon for use, or manufactured in Oregon for use in the State, shall have stamped or printed upon the outside of each of such original package, box, case or wrapper the date of manufacture of the contents thereof. Whenever any blasting powder shows such a state of disintegration, or decomposition, that it remains in a soft condition in a temperature of 42° F., or is in a state of crystallization, which is revealed by some portions being in a hard condition and surrounded by other portions in a soft condition, it shall be deemed to be bad and dangerous powder, and its sale and use is prohibited. Whenever any fuse shows by its appearance that it has been overheated, or if it is in a hard and brittle condition, which is seen by breaks and cracks in the wrapper around the outside of the fuse, the same shall be declared unfit for use and sale, and its use is forbidden. It shall be unlawful for any person or persons to sell or exchange, or to have in possession for use by his, or any of their, employees any blasting powder or fuse which has not been stamped or printed upon as required in this act, or any blasting powder of which the sale and use is prohibited by section 2 of the act, or any fuse declared to be unfit for use under provisions of section 3 of the act. Whoever violates any of the provisions of this law shall be held guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than $10 and not more than $100 for each offense. This law is now operative.

According to E. S. Shepherd, there are no definite compounds of copper and zinc, but six series of solid solutions.

Abstracts of Official Reports.

Tennessee Coal, Iron & Railroad Company.

This company owns and works extensive coal and iron properties in Alabama and Tennessee. It owns also 17 blast-furnaces, besides steel works, rolling mill and other plants, including 3,482 coke ovens. The latest report covers the calendar year 1904. The capital account shows $248,300 preferred stock; $22,552,800 common stock; $13,693,000 bonds; and $1,540,000 bonds of subsidiary companies guaranteed. The income account for the year, condensed, is as follows:

Gross sales and earnings	$9,535,404
Operating expenses	7,972,607
Net earnings	$1,562,797
Interest paid	$761,583
Depreciation and replacement	256,225
Sinking funds	48,730
Dividends on preferred stock	19,006
Total charges	$1,085,544
Surplus for 1904	$477,253
Balance from previous year	1,645,082
Surplus, Dec. 31, 1904	$2,122,335

The operating expenses were 83.6% of gross earnings; they were made up as follows: Cost of operating, including materials, labor, transportation and incidentals, $6,300,287, or 79.0%; repairs and maintenance, $1,213,844, or 15.2%; general expenses and taxes, $458,476, or 5.8% of the total expenses.

The production of raw material was 1,208,038 tons of iron ore, of which 1,095,432 tons were red ore from Red Mountain mines, 69,541 tons brown ore from Greeley mines and 43,065 tons brown ore from Bartow mines; 2,756,300 tons coal mined; 218,484 tons limestone and dolomite quarried. Of the coal mined, 1,331,063 tons were made into coke, producing 871,532 tons; an average yield of 1 ton of coke from 1.53 tons of coal. The pig iron made in the blast-furnaces was 475,314 tons. Assuming all the raw material to have been used, this shows an average of 2.54 tons iron ore and 0.46 ton flux to the ton of pig. No average can be given for coke, as a considerable quantity must have been used in the steel plant and other works. The production of basic open-hearth steel ingots was 176,657 tons; of finished steel, 138,598 tons, of which total steel rails were 124,496 tons, blooms, billets and slabs, 14,102 tons. The rolling-mill product included 2,724 tons muck-bar; 9,958 tons bars; 6,710 tons plates; a total of 19,392 tons. The average number of men employed was 8,680, and the payments for salaries and wages were $5,041,246 in all.

The president's reports says that, up to October, the year 1904 was one of low prices for pig iron, a very large tonnage having been sold on the basis of $9 for No. 2 Foundry. Since October, prices have been much higher, but the output of the furnaces has been restricted owing to the strike of the Union coal miners, which began in July and materially reduced the output of coal and coke. It was impossible to procure coke in any quantity outside, and in consequence a number of furnaces were idle during the last six months of the year. The five furnaces at Ensley, however, which supply metal for the steel plant, not only have been kept continuously in operation, but have made new high records for production at a much lower cost than in any previous year. This is the result largely of the improvements which had been installed during this and the preceding year. The new furnace, which has been under construction at Ensley, known as No. 6, has been completed. This furnace, which is the largest owned by the company, as well as one of the largest in the South, is of the most modern and approved design and equipped with ample boiler and blowing power and the latest filling and stock-handling devices.

The Ensley steel plant had a successful year. The output was largely increased over the preceding year, which is to be attributed to the improvements introduced. The average monthly product of steel for the last six months of the year shows a gain of over 25% and for the last quarter a gain of over 40%, as compared with 1903, the product per month for October, November and December, 1904, exceeding 20,000 tons. The operations of the rail mill have demonstrated the ability of this company to produce successfully open-hearth steel rails of so superior a quality as to insure a market for all that the mill is able to produce, inquiries for the current year having far exceeded the supply. The mill was in steady operation during the entire year, and beside increasing the output, which was over 16,000 tons of finished rails in December (exceeding by 100% the best month in 1903), developed a practice showing a relatively smaller percentage of second and imperfect-quality rails than is attained by most other mills. The open-hearth department is being enlarged by the construction of another furnace, which will increase the product 2,000 to 2,500 tons per month. Necessary soaking pits and other improvements to handle the increased product are being built.

The work of improving the properties, inaugurated by the present management, has gone forward steadily through the year, although, on account of uncertain trade conditions during the earlier months, comparatively little new work was undertaken. The completion of the new blast-furnace and the additions to the equipment of the old furnaces at Ensley, as well as the improvements at the steel plant, have been alluded to. The progress of the comprehensive scheme for the entire re-equipment of the Red Ore mines, inaugurated in 1902, has been unavoidably slow by reason of the necessity of maintaining a steady output of ore to supply the needs of the furnaces. This

work, however, has been completed during the year, and these mines are now equipped as well as any like mines in the United States, and are in a position to furnish ore in such quantity as may be required and at greatly reduced cost. The ability of the mines to produce has so far exceeded the demands made by our own operations that they were able to make sales of ore for the coming year to outside furnace interests on terms very advantageous to the company. The new shops at Muscoda and Fossil have already saved their cost several times over to the company in the promptitude and economy with which the repair work of the iron mines division has been performed, and they have enabled the management to build many of its own mine cars and other underground equipment at a cost much below what would have been charged outside. Large stock-pile grounds have been completed at Fossil mines No. 7 and 8, and the stocking of ore at these points has been begun. It is proposed to accumulate and carry from 100,000 to 150,000 tons in stock, which can be readily loaded into cars by steam-shovel; this as a protection to the furnaces against a possible future shortage in ore supply due to labor difficulties. At the brown-ore properties at Greeley, Ala., and Bartow, Ga., the work of development has been prosecuted with vigor, and a large body of ore, sufficient for several years' operations, has been uncovered. The properties are now so well opened up that the quantity of ore which can be produced is limited only by the furnace requirements.

In the coal department advantage was taken of the idleness resulting from the strike to equip other mines in the Pratt field with electric haulage, pumping and coal-cutting machinery, similar to that introduced in Pratt No. 3 mine last year, which has been so successful in increasing product and decreasing cost. This work is now approaching completion in Pratt mines No. 4, 5 and 8.

The report says: "Early in the summer of 1904 a committee of appraisers was appointed, representing the Sloss-Sheffield Steel & Iron Company, the Republic Iron & Steel Company, and this company, to estimate the amount and quality of the coal and iron ore owned by each company. An examination covering several months was conducted, as the result of which a report signed by every member of the committee was submitted, showing that this company owns in fee over 395,000,000 tons of red ore, of which 381,000,000 tons are graded as first class, 10,177,000 tons of brown ore and over 1,623,000,000 tons of coal, of which 809,112,000 tons are coking coal. In the non-coking coal is included, however, 300,000,000 tons of Cahaba seam coal, which is unexcelled in Alabama or the South for steam and domestic purposes, and commands the highest market price of any grade of coal in the district. The men in charge of your iron mines estimate the holdings of iron ore of your company to be still larger: Of first-class red ore, over 450,000,000 tons; of second-class red ore, over 95,000,000 tons; and of brown ore, 16,900,000 tons. From the iron ore owned in fee by this company as many tons of pig iron can be made as from all the ore that has been shipped from the Lake Superior region from 1855 to 1904, inclusive; and, assuming that your furnaces in Alabama make 700,000 tons of pig iron per year, it would require 200 years to exhaust your supply of coking coal and first-class red and brown ores.

"During the past year, in spite of the heavy expense and incidental loss due to the coal strike, and the heavy disbursements for construction and improvement, the working capital of the company has nevertheless been fully maintained. During the years 1902 to 1904, inclusive, the sum of $4,024,282 has been expended for repair and maintenance account, the entire sum being charged to cost of operations. In proportion to our equipment this sum is very large and indicates that, in addition to ordinary current repairs, the condition of your property has been improved by the expenditure of a large sum, which, while charged to cost, might under less rigid accounting have properly been charged to capital account."

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ending June 13, 1905.

792,011. PROCESS OF GENERATING COMBUSTIBLE GAS.—Carleton Ellis, New York, N. Y., assignor to Eldred Process Company, New York, N. Y.

792,022. ELECTRIC FURNACE.—Ernst Haagn, Hanau, Germany, assignor to the firm of W. C. Heraeus, Hanau, Germany.

792,023. DRILL.—Charles H. Haeseler, Philadelphia, Pa., assignor to the Ingersoll-Sergeant Drill Company, New York, N. Y.

792,028. METHOD OF COATING.—Lewis A. Harker, Cincinnati, Ohio, assignor to the Safety Can Company, Cincinnati, Ohio.

792,031. CLAY-WASHING MACHINE.—Charles B. Herrick and James W. Baldwin, Ottawa, Ill.

792,047. APPARATUS FOR CHANGING BLAST-FURNACE BELLS.—Walter Kennedy, Allegheny, Pa.

792,048. FURNACE.—George S. Kent, Buffalo, N. Y.

792,053. ROASTING-FURNACE. — Frank Klepetko, New York, N. Y.

792,070. PROCESS OF HARDENING AND TEMPERING COPPER.—Carrie R. Plumer, Seattle, Wash.

792,099. PROCESS OF MAKING INGOTS FOR SEAMLESS GOLD-PLATED WIRE.—Herbert M. Williams, Attleboro, Mass.

792,111. PLACER-MACHINE.—David T. Barry, Denver, Colo.

792,153. BRICK OR BRIQUETTE MACHINE.—Peter McKinnon, South Berkeley, Cal.

792,161. CHILEAN MILL.—Stephen H. Pitkin and James H. Stratton, Akron, Ohio, assignors to the Wellman-Seaver-Morgan Company, Cleveland, Ohio.

792,169. ROTARY FURNACE.—Walter S. Rockwell, New York, N. Y., assignor to Rockwell Engineering Company, New York, N. Y.

792,179. TUYERE-IRON.—Charles O. Swenson, Minneapolis, Minn.

792,205. CATALYTIC APPARATUS FOR MAKING SULPHURIC ANHYDRIDE.—Georg Eschellmann and Albert Harmuth, St. Petersburg, Russia, assignors to Tov. Tentelevskago Ximichesk Zavoda, St. Petersburg, Russia.

792,217. MECHANISM FOR LIFTING ROCK-DRILLS.—Jonathan Jenkins, Lord, Md.

792,221. MOLDING-MACHINE FOR MANUFACTURING BUILDING-STONE.—Jorgen J. Jorgensen, Wedel, Germany.

792,223. METALLURGICAL FURNACE.—Jacob W. Lansing, San Francisco, Cal.

792,231. ART OF CROSS-ROLLING TUBULAR BODIES OR BLANKS IN A HEATED STATE.—John H. Nicholson, Pittsburg, Pa., assignor to National Tube Company, New York, N. Y.

792,250. GOLD-DREDGING MACHINE.—Sherman L. Crawford and Lester J. Crawford, Hoquiam, and William F. Crawford, Bremerton, Wash.

792,255. ELECTRIC FURNACE.—Francis A. J. Fitz Gerald and Peter M. Bennie, Niagara Falls, N. Y.

792,259, 792,260 and 792,261. PROCESS OF MAKING CYANIDES.—Jacob Grossmann, Manchester, England, assignor to the Grossmann Cyanide Patents Syndicate, Ltd., Manchester, England.

792,287 and 792,288. CHANNELING-MACHINE.—William Prellwitz, Easton, Pa., assignor to the Ingersoll-Sergeant Drill Company, New York, N. Y.

792,306. MOTOR-OPERATED DUMPING-CAR.—Carl P. Astrom, East Orange, N. J., assignor to M. H. Treadwell & Company, New York.

792,307. PROCESS OF ELECTRO-DEPOSITING ANTIMONY.—Anson G. Betts, Troy, N. Y.

792,322. OIL-WELL DRILL.—Joseph E. Downer, Allenport, Pa.

792,330. MINE-CAGE.—John Herzler, Henry Henninger, and William Fenner, Belleville, Ill.

792,331. EXCAVATOR.—Charles Kerr and John T. Kerr, Armada, Cal.

792,344. PROSPECTOR'S DRILL.—Johan W. T. Olan, Seattle, Wash., assignor of one-half to Henry M. H. Bolander, Chicago, Ill.

792,349. PISTON OR PLUNGER FOR DEEP WELLS.—Charles M. Ray, Lake City, Fla.

792,379. AMMONIA-STILL.—Herrman A. Abendroth, Berlin, Germany.

792,440. APPARATUS FOR TREATING FERRUGINOUS ORE FOR THE MANUFACTURE OF IRON AND STEEL THEREFROM.—Montague Moore, Melbourne, and Thomas J. Heskett, Brunswick, Victoria, Australia.

792,452. MANUFACTURE OF CRUCIBLES.—Augustin L. J. Queneau, South Bethlehem, Pa.

792,463. HOISTING DEVICE.—Michael Schiller, Nuremberg, Germany, assignor to Siemens-Schuckert-Werke, G. M. B. H., Berlin, Germany.

792,495. CAR-LOADER.—Frederick D. Buffum, Newton, Mass.

792,511 and 792,512. EXPLOSIVE COMPOSITION.—Adolph Frank, Charlottenburg, Germany.

792,515. PROCESS OF MAKING NITRITES.—Jacob Grossman, Manchester, England.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending May 13, 1905.

12,777 of 1904. ROCK DRILL SHARPENER.—J. A. G. Kirsten, Johannesburg, Transvaal. A machine for sharpening rock drills of cruciform section.

27,757 of 1904. ZINC SULPHIDE PAINT.—J. Giband and O. Bang, Hennebout, France. The addition of sulphate of lime, carbonate of lime, and magnesia to sulphide of zinc or to a mixture of sulphide of zinc and sulphate of baryta, thus producing a more lasting paint without diminishing the covering power.

27,839 of 1904. UTILIZING CUPOLA GASES.—A. Bayot, Marly, France. Arrangement of pipes so as to catch the gases such as carbon monoxide and carbohydrates given off from foundry cupolas and utilizing them for heating the cupolas.

Special Correspondence.

San Francisco. June 14.

Under the new State law, mentioned in the last letter, intended to prevent the issuance of exaggerated prospectuses by mining companies, and providing a penalty of fine and imprisonment for disseminating false information concerning mining properties, the State mineralogist is taking steps to investigate and expose certain 'fake' companies. He has issued a circular calling attention to the new law and had it printed in hundreds of local newspapers. The State Mining Bureau in this city in charge of Lewis E. Aubury, State mineralogist, receives many inquiries relating to mining companies in California. It is found that in several instances representations made in certain circulars and prospectuses are grossly untrue. Some are advertised as producers and dividend-payers where no production has been made whatever. Others have taken the results of near-by properties and claimed them as their own. The State mineralogist is making a personal examination into the conditions of certain companies, and when suitable evidence is found will begin legal prosecutions against the officers or promoters of such fraudulent schemes. The 'mines' themselves will be visited in person by the mineralogist and the true conditions ascertained, so that the public may be duly notified. This practical step by a State official should result in schemes of this character being promptly exposed, and innocent investors thus protected.

Two of the men implicated in the blowing up of the Angels quartz mine, in Calaveras county, owned by James V. Coleman, of San Francisco, have been arrested on a felony charge, a miner having confessed that both of them instructed him to drill the holes for the 30 blasts of dynamite which wrecked the mine. To make certain that the mine would be greatly damaged, blasts were placed on three levels. At the 500-ft. level 13 shots were put in; at the 400-ft. level eight were set, and at the 300-ft. level nine were inserted. All of them were so connected that they were fired simultaneously shortly after the night shift had reached the surface. The explosion shook the ground for some distance, and an immediate investigation showed that the mine had been deliberately wrecked. It is expected that it will take fully a year to clear away the débris and re-timber the mine. The object is supposed to be revenge on the part of men about to be discharged.

A decisive step in the contest between the farmers in Glen Cove district and the Selby Smelting & Lead Co., on the shore of San Francisco bay, has been taken through the filing of 15 suits for damages against the company, aggregating $78,950. Other suits of similar character will shortly be filed. The substance of the complaints is practically the same. The farmers allege that noxious gases from the Selby plant have been allowed to be carried by the winds on to their pasture and grain fields, rendering the crops useless and poisoning the live stock, especially the horses. They further allege that the greatest damage is sustained on the northern shores of Carquinez Straits, at what is known as Dillon's Point and Glen Cove, near the smelting works.

At the Royal Consolidated Mines (California) Co., Ltd., Hodson, Calaveras county, a cross-vein has been discovered some 60 ft. in width carying values reported as from $10 to $50 per ton. If this be verified by developments, it may be considered one of the richest strikes made in this State in some years. The mine is an important one and has the record of the lowest costs in mining and milling of any in California. The ore thus far worked has been of exceptional low grade, yet a profit has been made. The milling plant is one of 160 stamps—among the largest in the State. More or less litigation has somewhat hampered progress, and J. C. Kemp Van Ee, the manager from the beginning, recently left for property in other hands. This mine has 160 stamps. The Yellow Aster, in Kern county, has 130 stamps, and several more have 100 stamps. Now the Yellow Aster company, already having 130 stamps, is to add 170 stamps, making 300 in all, which will be larger than any other stamp mill in the State, and the largest in the United States outside of those in Alaska and South Dakota.

Denver. June 14.

The persistent rumors of the sale of the United States Reduction & Refining Co.'s plants at Colorado Springs, to the American Smelting & Refining Co. and of a consequent raise in treatment charges on the latter's part, are officially set at rest by C. M. McNeill, general manager of the former company, who announces that there is no truth in these reports. There seems to be a strong probability that the smelter trust will acquire the property of the Utah Copper Co. at Bingham.

El Paso mine in the Cripple Creek district is continuing its remarkable record and during the past two weeks the ore shipments have averaged $120 per ton, while a large amount of bonanza ore is being held back, from which it is expected that a carload will soon be shipped.

An interesting incident of the development of the Western slope, close to the Colorado-Utah line was the blowing in of the 50-ton plant of the Western Slope Mining & Smelting Co., in Unaweep valley.

S. S. Downer, superintendent, and H. S. Tarbell, coiner, of the Denver mint, have just returned from Washington and the civil service examinations for the different positions will begin this week.

The suit of G. C. Volk for the sum of $200,000 damages against the Stratton's Independence Co. will be transferred to the Federal Court in this city, as the defendant company is a foreign corporation.

Although no particulars can be secured, it is stated on good authority that contracts have been arranged in New York between the Denver & Rio Grande Railroad Co. and the Western Pacific Co., for a line to be built from Salt Lake City to the Pacific coast. At a point about 12 miles from the Utah line, and nearly 100 miles from the railroad at the present time, although only about 20 miles from the proposed Moffat line, in Routt county, some valuable uranium and vanadium deposits have lately been discovered, which promise well for the future, and concentrating works are being talked of by the owners.

Scranton. June 19.

The Reliance Coal Co., which has opened a new colliery near the works of the Atlantic Refining Co., Pittston, commenced work on June 13, in sinking a new shaft which will touch the lower veins. Several months ago the company commenced running the breaker, which has a capacity now of about 200 tons a day. With the encouragement received and the promises of opening up new veins the company feels with the new opening they can double its capacity. The shaft is being sunk under the direction of Superintendent Theodore Hogan. Since he has assumed charge the company is increasing its output. The coal is of excellent quality. With the new shaft the company will have access to nearly 90 acres of good coal.

From the report of the scale commissioner, C. P. Neill, miners in the anthracite region will receive no increase for the month of May. The report states that the average price of white-ash coal, sizes above pea, sold at New York, between Perth Amboy and Edgewater, as reported to the bureau of anthracite statistics for May, was only $4.50 a ton, f. o. b. There has been no increase for the past three months.

At No. 1 colliery of the Erie company at Dunmore, through a misunderstanding of signals, the carriage was drawn up beyond the head and the top of the shaft was torn away. The miners were idle for a few days while repairs were being made.

Carney and Brown's mines at Dunmore were idle for a few days, owing to a peculiar accident, a car falling down the shaft. Fortunately, no one was hurt. The cribbing was torn away and considerable excitement caused for a short time. The men in the mines were all brought out through a second opening.

One of the most serious caves that has occurred in a long time around Scranton has taken place at the north end section of this city. The cave covers a large area.

A small street that feeds the North End Coal Co. colliery is cracked. The area affected covers many acres.

Five hundred men and boys went on strike at the Elliott & McGuire colliery, at the Sibley, because they insist on a dinner hour longer than 15 minutes. This is one grievance, but the men have others, which must be righted, they say, before they will return to work. Dissatisfaction among the employees has existed for some time, but not to any serious extent, until June 10, when, at a meeting, the men decided upon immediate action. On the morning of June 12, when the workmen gathered at the mine, preparatory to the day's work, the trouble came to a head. Before they would consent to start in at work they demanded a longer time for luncheon, insisting upon receiving the regular half hour, which prevails at other collieries. As an alternative they suggested the elimination altogether of the dinner hour, and that four o'clock mark the close of the day. Another grievance which the strikers claim must be satisfied, concerns their privilege of carrying their dinners inside the workings. Under the present rules all dinner buckets must be stored outside the mine each morning by the men prior to descending into the shaft. This rule the strikers claim is to prevent them from taking a partial lunch during work hours. In every mine, the strikers say, the employees are permitted to eat whenever they have a spare moment, so long as the actual work is not neglected. Rather than continue work, pending an adjustment of the alleged troubles the men returned to their homes.

Houghton. June 17.

A development of the last few weeks, which will result in greatly increased prosperity in Calumet, the metropolis of the lake copper district, is the decision of the Calumet & Hecla Mining Co. to resume operations in No. 16 shaft on the Osceola amygdaloid branch. Preparations for beginning work at that point are now under way, and it is expected that they will be completed and a large force of men put to work in a short time. The Calumet & Hecla company has an extensive mine on the Osceola lode, located a few hundred feet to the eastward of the main workings on the Calumet conglomerate. The Osceola branch was opened a number of years ago, during the 17c. copper market, but was closed down in 1901. About this time last year the company decided to resume work in No. 13 shaft, the southernmost opening of the Osceola branch, and operations have been carried forward steadily at that point since the date of resumption, the production from No. 13 shaft averaging 500 tons of rock daily. It is understood that the results from the amygdaloid rock have been very encouraging, and no doubt the successful operations there have hastened the resumption of work in No. 16.

There are five shafts opened on the Calumet & Hecla's Osceola branch. All have been sunk in depths averaging 1,400 to 1,700 ft., and upward of 30 miles of lateral and connecting openings have been driven on various levels. The resumption of operations at No. 13 about a year ago resulted in the addition of nearly 500 men to the working force, and it is presumed that nearly as many, if not more, will be given employment at No. 16 shaft when operations are in full blast. This will make 1,000 new men added to the force of the Calumet & Hecla Mining Co. alone during the past twelve months. In addition, many new men have been added to the forces of other mining companies, and it is expected that upward of 2,000 men will be employed during the summer in the construction of the Keweenaw Central railway.

Diamond drill work at the Tecumseh property is progressing satisfactorily, but nothing of importance has been revealed to date. It is expected that plans for the future investigation of the property will be gone over and prepared during President's Fay's visit to the lake. The Tecumseh has a small but complete surface plant, which is available for use in the development of the Kearsarge amygdaloid lode, providing the formation is found in a sufficiently promising condition.

At the Allouez mine the sinking crew is now engaged in cutting the plat in No. 1 shaft at the fourth level. It should be completed and everything in the shaft in readiness for sinking in a few days. The permanent Nordberg hoisting engine has gone into service, and hereafter it will be possible to conduct operations with greater facility.

Duluth. June 17.

A great deal of diamond-drill work is under way all through the Lake Superior iron region, as well as in the copper districts south of the lake. There are many churn drills working on the Mesabi, a few in the Deerwood region and some near Baraboo. Diamond drilling on the iron ranges is less active on the Vermilion than elsewhere, and only one drill is now busy there. On the Mesabi most of the work is with churn drills, diamonds being swung in only when needed to drive holes through hard ground. But there are several drills at various points of the Gogebic, and a good deal of work is going on both near Bessemer and Ironwood, near Pence and Hurley, and west of Mellen. Most of this is at old mines that have been abandoned and that are to be revived, if possible, and made active once more. There is more of this sort of work on the Gogebic than might be supposed, and more than most mining men suspect. Around Negaunee work is in progress. The Oliver Iron Mining Co. is drilling the old race-track ground and some other work is in progress near by. Between Ishpeming and Marquette two drills are busy, and in the Cascade range there are a few. On the Menominee range several drills are busy in the Iron Mountain and Iron River districts. In all, about 33 diamond drills are busy now in this region.

Exploration in the Deerwood district by drill has not proved entirely satisfactory to Pickands, Mather & Co., and the firm will at once sink a shaft on Section 8, 45-29. The lean ore that has been found in drillwork there is about 70 ft. below surface, and it will be an easy matter to sink into it and explore accurately by shaft. Several additional parties are mentioned as about to go in there for exploration, but so far there has been little or no increase in the amount of work under way for some months.

The Wisconsin & Michigan railway is expanding its lines and will soon be in touch with all the chief ore-producing centers of the Menominee range. It has just formed the Quinnesec & Western road, to connect the main line with mines at Iron Mountain. This will bring it into touch with the Chapin, Aragon and Pewabic, the largest and most important mines of the entire Menominee range. The road has just voted to increase its capital stock in order to enable it to reach Duluth. Just what it is after in the Minnesota districts is hard to see. It cannot take any of the ore controlled by the United States Steel or the Great Northern, and those roads have most traffic controlled by agreements and leases, most of them of considerable duration. But the plan upon which the Wisconsin & Michigan has made an entry into the Menominee has been so revolutionary and unique that it is hard to tell what it may try. This plan was to develop the car-ferry system of the lakes so that ore trains might be loaded on cars, in bulk, and train and ore moved from its upper Lake Michigan ports to ore-receiving ports. This was tried in the case of furnaces at Chicago, where the distance from its docks is nearly 300 miles, and has worked. There is probably no reason why, if the plan works for 300 miles, as distinct from its usual operation for a few miles across some waterway, that it should not work for 800 or 1,000, which is the distance from Duluth to Lake Erie ore-receiving ports. But it is not conceivable that the road proposes to build to Duluth for this.

Bisbee. June 15.

The purchasers of the Apache group of partly developed claims near Hachita, mentioned in this correspondence a month or more ago, were Duluth, Minn., men. They are to organize a company of $1,000,000 capital to develop and mine the property. These claims were worked for many years by one Anderson, who was a third owner. He operated in a desultory way and never got more than 50 ft. away from contact.

Saginaw Development Co., operating on the east side of Mule Pass gulch here, has cut the big Bisbee basin of water at 910 ft. and is hurrying forward its pumping plant, which was ordered with this water in expectation. This plant is to be about 3,000 gallons minute capacity, and is similar to that of Junction. With both Junction and Saginaw forking out water, the burden will be less severe on Pittsburg. Junction, though at a lower level in its shaft than the water at Pittsburg, is not yet getting the full water, though its pumping increases daily. It is expected almost daily to reach the point where its 3,000-gallon capacity will suddenly be all in use. The tapping of this immense basin by Saginaw is a most encouraging feature of that property's situation, as it seems to indicate the continuance to its ground of the broken lime formation in which ore has been concentrated. It really looks as though Saginaw might become a winner. It has been managed with skill and vigor, and the owners, though not mining men, have not been discouraged at costs that might have scared many unexperienced into an early grave—as has been shown here in properties close by. That they were not is doubtless due to the competency of management locally.

This tapping of the water level in Saginaw is also a most important feature of the situation with reference to American Development. This is a group of claims taken a year ago by T. F. Cole, of Duluth, Minn., and his friends, and upon which no work has been done. The group lies between Pittsburg and Saginaw, with Junction adjoining on the north. It is evident that the ore-bearing formation extends clear across American and the importance of this fact can scarcely be appreciated. American is not compelled to develop for some time, and it is probable that the water will be out of the basin and the ore proved before it puts a drill into the ground.

The Arizona Copper Co. is adding to its Clifton plant a large briquette plant, for the briquetting of coal and coke dust, flue dust and concentrates. For the present it will be used for coal and coke only, and the briquettes will be made by the addition of heavy pitch, the product going into the furnaces.

Smelter work at Douglas has been pushed of late, and there is an immense amount of steel construction under way there. This is for both Copper Queen and Calumet & Arizona companies. The latter's smelts have been greatly changed and increased, in addition to the mere addition of No. 4 furnace and the foundation of No. 5. Flues, dust chambers, converter room, boiler and power capacity, a 200-ft. steel stack, and other notable changes have been made and the plant will make copper at less cost than ever before. The Queen plant will be a tremendous affair when completed.

Butte. June 13.

The five companies comprising the Amalgamated have submitted to the county assessor their figures showing the gross and net yield of their properties during the year ended June 1. With the exception of the Colorado company, now the Trenton, each company shows an increase over the year ended June 1, 1904. There is only a falling off of a little more than $4,000 in the net earnings of this company, which is due to the fact that the Gagnon mine, its principal producer, was closed for repairs several months. Total net earnings for the five companies for year just closed aggregate $8,692,243, against $6,240,025 for the year previous. Of this sum the Boston & Montana is credited with $5,855,620 against $4,574,498 for the year before. The Anaconda is credited with net earnings aggregating $2,259,693 against $1,259,875 for the year previous; the Parrot, $328,106 against $233,964.68; the Colorado (Trenton) $70,110 against $74,833, and the Butte & Boston, $178,712 against $96,853. The mines of the Boston & Montana yielded 1,138,307 tons of ore last year; the Anaconda 1,473,644 tons; Parrot, 167,963; Trenton, 150,296; Butte & Boston, 260,433, and the Washoe, 102,941 tons. The gross receipts were: Boston & Montana, $14,634,923; Anaconda, $13,787,345; Parrot, $1,449,851; Trenton, $847,421; Butte & Boston, $1,932,837; Washoe, $1,097,018. The Washoe shows no profits, because its revenue was put into improvements. It cost the Boston & Montana $3,217,810 to mine its ore; the Anaconda, $5,242,303; Parrot, $631,397; Trenton, $453,553; Butte & Boston, $862,702; Washoe, $442,044. Cost of reduction: Boston & Montana, $2,515,146; Anaconda, $4,422,212; Parrot, $460,113; Trenton, $301,213; Butte & Boston, $637,131; Washoe, $390,564. Total expenses for mining, freight, reduction, marketing and improvements: Boston & Montana, $8,779,303; Anaconda, $11,527,651; Parrot, $1,121,744; Trenton, $777,311; Butte & Boston, $1,754,124; Washoe, $1,215,561. The Boston & Montana paid out for freight alone $1,138,307.

Drills to be operated by electricity have been ordered for use in the Barnes-King gold mines in Fergus county. When installed, which will be in a few days, they will be the first of their class in use in Montana. Mining men in Butte are interested in the work of the drills and will watch the outcome with a view of using them here in the place of compressed air. E. W. King, one of the owners of the property, says the mines are yielding 225 tons of ore per day and those at Kendall, also in operation under the Barnes-King management, are giving up 350 tons, while the Alder Gulch Company, operating in the Little Rockies, is taking out 100 tons per day and is preparing to increase it to 150.

A body of rich silver-gold ore has been made in the Kessler property in this district. The property is under bond to the Black rock company, composed principally of Minneapolis men.

Leadville. June 15.

Since the discovery of mineral in the drill hole on the Little Sister claim, lower Rock hill, the section has received more or less attention from mining men. The stand is taken that the Leadville formation extends to the south, and to prove this a company has been formed in Denver to explore the country in Iowa gulch. Over 100 acres have been secured under bond and lease directly south of the Frank and Parson claims and a shaft will be sunk to the blue line. Work will be started by the first of the mouth.

On the Nil Desperandum some drifting is being carried on from the bottom of the shaft, 750 ft., north and south; in the north drift a small streak of ore is being followed that may lead to the Ames shoot of ore that comes from Iron hill. It will take the south drift 750 ft. to reach the ore-shoot from the upper section of the hill. The sinking of the new shaft to the west is making fair progress.

On the Bessie Wilgus, in the immense body of lime, only prospect work is being carried on; small pockets of ore are occasionally opened and they eventually may lead to the main ore-shoot. Drifting and upraising is the principal working that is being undertaken.

At Adelaide Park, considerable work is being carried on in this section of the camp and several properties are shipping a fair grade of iron. At the Flagstaff a force of men are employed drifting in different directions, and in two of the drifts small streaks of ore are being followed. They probably lead to the old Mikado ore-shoot that trends through this ground. The Humboldt, to the south, is shipping 250 tons monthly of carbonate and about 20 tons daily of iron.

The principal work being carried on by the Fryer Hill Mines Co. is at El Paso, from which a good grade of ore is being shipped, and extensive exploration work is being carried on. At the Cora Belle and Bangkok and Jimmy Lee silicious ore is being shipped.

The machinery for the new shaft at the Sunday is in place and sinking has again been resumed on the new shaft. The shaft will be sent down 500 ft. and drifts started at different points to connect with the old workings. The body of ore still remains in the old workings, but the company will not touch it until the connections are made with the new shaft.

Work for the summer has been resumed on the Onyx group, and it is expected that a better grade of ore will be uncovered than that which was shipped from the claims last season. The ore then ran 5 oz. gold per ton, principally from the surface. This season work will be carried

on at greater depth. The Gold King and several other claims will soon resume work.

The body of ore found in the new shaft at the Favorite, Big Evans gulch, holds good and the lessees are sending out regular shipments. While opening a place for ore-bins a body of carbonate was found, and from this several cars have been shipped. It is presumed that this ore is the same as opened in the shaft, and if development work proves it to be so the lessees have opened a good thing.

Dawson. June 9.

The Dominion Government has consented to two United States customs inspectors being stationed at Dawson, to inspect all goods for the American Yukon. This agreement will obviate delays for inspection purposes at Eagle City of steamers leaving Dawson for Tanana and other Alaskan points.

The Yukon council has agreed to vote $2,500 for the purpose of entertaining members of the party who will next month visit Dawson in connection with the excursion of the American Institute of Mining Engineers.

Reports from Barker creek, a tributary of Stewart river, state that miners from Stewart, Duncan, and other streams have been staking ground on Barker, where the discoverer, after two seasons' work, claims to have located a paystreak 30 ft. wide and running 25 to 30 cents to the small bucket, and to have also found pay dirt on the benches.

A result of a lot of work done during last winter on Glacier creek, in the Canadian Forty-mile country, about 50 miles west of Dawson, is expected to be that that stream will this season produce more gold than in any previous year.

Dispatches from Ottawa outline a notable speech recently made in the House of Commons by Dr. Thompson, member for Yukon territory. In the course of his remarks he reminded the House that since 1896 the Yukon had yielded $120,000,000 in gold, and that during the years 1897 and 1898 the rush of gold seekers to this territory was the greatest known in modern times. He advocated abolition of the royalty charged on gold, and of the miner's certificate fee. If a tax on placer gold were necessary, it should be collected at the boundary line, so as to keep the gold in Canada as far as practicable. He urged the remission for ten years of all taxes on gold from quartz and copper, and asked that gold dredges and mining machinery be admitted into the country duty free. He pleaded for a representative assembly, instead of a territorial council in the Yukon, and objected to the suggested joining of the territory to British Columbia. The speech drew congratulations from the Premier, Sir Wilfred Laurier, who described it as an able, temperate and judicious address, and promised that the Government would investigate the important matters brought to the notice of the House by Dr. Thompson. It might be necessary to have changes made in the mining regulations of the Yukon, which could only be made perfect by many changes. He could not agree to the abolition of the royalty on gold, which was a tax, and the people of the Yukon should not object to pay their share of taxation. It was a question for consideration whether the charge was too high. He approved the proposed suspension for ten years of the export duty on gold from quartz, and on copper. In regard to the question of keeping the gold in Canada, he thought the Dominion Government should buy it, but it will be necessary to first have a mint established, and as well an assay office at Dawson. The policy of the Government as to hydraulic concessions would in future be to refuse to grant them, for what was wanted in the Yukon was water more than gold. The Government had sent a mining engineer to go fully into the matter, with the object of devising a new system that would be more satisfactory to the people of the Yukon. He thought there would be no difficulty in getting the House to agree to an exemption of mining machinery from paying customs duty. He agreed that the character of the Yukon council must be changed, so as to give it new life. As to whether the Yukon should be attached to British Columbia, he would say neither yes nor no, but it had not been in his mind to have such a change made.

Toronto. June 16.

E. T. Corkill, Inspector of Mines, has returned to Toronto from a trip through the eastern part of the province. He reports that the pyrite industry is flourishing. The American Madoc Mining Co. is installing a plant on its iron pyrite property at Bogart, near Tweed, Hastings county. An American company is developing a deposit of copper pyrite, which was found to displace the iron ore in the Coe iron mine at Eldorado, in the same county. Shafts are being sunk and the company is putting in an air compressor and boilers.

W. G. Trethewey passed through Toronto this week, *en route* to New York, with a shipment of four carloads of silver-cobalt ore from the Cobalt mine.

Frank Cochrane, Ontario Minister of Lands and Mines, was returned by acclamation as a member of the legislature for East Nipissing on June 13, and has commenced his official duties.

Manager Seeley of the Helen iron mine, in the Michipicoten district, reports that over 1,000 tons of ore per day are now being taken out, 30,000 tons having been already shipped this season. A new shaft has been sunk, giving access to fine ore 400 ft. below the original bed. The entire year's output has been sold.

The Rainy River Development Co., Ltd., with a capital of $1,500,000, the shares of which are all held in England, was declared insolvent on June 13 by Judge Meredith on a winding-up order granted. There was no opposition to the application. The liabilities are $10,000, and the only assets available are mining lands of doubtful value. About $500,000 has been expended in mining properties and development work in New Ontario. The failure is said to be due to bad management. The company's representative in Ontario is W. A. Weir, of Kenora (Rat Portage).

The Cushing Sulphite Fibre Co., operating in New Brunswick, incorporated in 1898, has been ordered to be wound up by the courts. They had a share capital of $500,000, and issued $280,000 of bonds. Interest is owing to the extent of $100,000. The largest interest in the concern is held by Ed. Partington, of Manchester, England.

Dr. R. W. Bell, Inspector of the Provincial Board of Health, has returned here from a month's trip of inspection of mining, lumber and railroad construction camps in Northern Ontario, which was undertaken to investigate complaints as regards sanitary conditions. He declares that such complaints are unfounded, and that there is a general desire among employers to observe the regulations. The northern districts are practically free from smallpox and there are but few cases of contagious disease.

W. H. Plummer, of Sault Ste. Marie, has been recommended by the Ontario Government to replace N. W. Rowell, who recently resigned his position as director representing the Government on the Board of the Consolidated Lake Superior Co. W. H. Hearst, of Sault Ste. Marie, has been appointed government agent to protect the interests of the province in legal questions arising out of the relations between the company and the Government. These changes are the result of the recent change of administration.

Victoria, B. C. June 12.

Coast.—The formal opening of the tunnel the Vancouver Power Co. has driven a distance of 12,775 ft. through the granite mountain separating Lake Coquitlam and Lake Beautiful, in connection with the hydro-electric power generating plant the company has installed within a few miles of the city of Vancouver, took place on June 10. The ceremony of opening the gates that admitted the waters of the big storage lake to the tunnel connecting with the smaller lake, which is a balancing reservoir, was performed by Sir Henri G. Joly de Lotbiniere, lieutenant-governor of British Columbia, in the presence of a large party of guests of the company, including men prominent in the public life of the province. The incident marked the consummation of an undertaking that will be of great importance to the industrial

interests of the cities of Vancouver and New Westminster and adjacent district, which will be supplied with cheap light and power from this source. The Vancouver Power Co. is a subsidiary organization to British Columbia Electric Railway Co., which owns the street railways in Victoria, Vancouver and New Westminster, and the inter-urban electric railway between the two last-mentioned. This English company has invested more than $6,500,000 in British Columbia, and its investments are in the way of proving remunerative to its stockholders.

In Victoria and Vancouver, on the coast, and at Nelson and Rossland, in West Kootenay, interest is being taken in the promised visit of members of the American Institute of Mining Engineers this month and next. In all the cities named committees have in hand arrangements for the suitable entertainment of the members and others who will accompany them, and for placing at their disposal full information relative to the mining and metallurgical industries of the province.

East Kootenay.—Work is to be resumed on the North Star mine; the manager, Neil McL. Curran, having returned from Montreal, where he went to discuss the position with the directors of the owning company. The Paradise and Delphine mines, in the Windermere mining division, are also to ship ore this summer.

The Crow's Nest Pass Coal Co. has entered into a new agreement with its men. This became operative on June 1, and it is to remain in force until March 31, 1907. Not only has it been signed by a committee representing the men, but each individual employee of the company has been required to sign it, so as to make it binding upon the men individually. Hereafter every man entering the company's employ during the period covered by the agreement will also be required to sign it. President Sherman, one of the officers of the United Mine Workers of America, is reported to have stated that the wage schedule in force during the last two years has in some cases been slightly increased, and that several of the working conditions have also been improved upon. The ballot taken at the company's three collieries—Fernie, Michel and Carbonado—resulted in a 10 to 1 vote in favor of the new agreement, the exact result of poll having been 478 votes for and 47 against. A number of Italian and Slavonic employees were attending lodge meetings at the time, so did not vote, but it is generally understood they are favorable to the new agreement. There is general satisfaction at this amicable adjustment of all differences between the company and its employees.

The new eight-hour "bank to bank" law having come into operation on June 1, the Crow's Nest Pass Coal Co. has posted at its Coal Creek colliery the following notice: "Beginning June 1, 1905, the following rules will govern the working of Coal Creek mines: Shifts—7 A. M. to 3 P. M.; 3 P. M. to 11 P. M.; 11 P. M. to 7 A. M. No time allowed for lunch. Shifts begin and end at pit mouth. No one allowed to work more than 8 hours in any 24 hours." It is understood that while this rule will be rigidly enforced, the company will insist that men be punctual in entering the mine at the proper shift hour or not at all.

Mexico. June 12.

Though some of the plants of the American Smelting & Refining Co., especially that at Monterey, are running short of their capacity, because of the scarcity of silicious ores, it is nevertheless stated by one of the head officials of the southern department, that active operations will be started within six weeks on the proposed Chihuahua plant, which will be of 800 tons capacity, and will be pushed to completion probably in advance of the Velardeña plant in Durango. This plant is 9 km. from the Pedriceña station of the Mexican International railroad, and the railroads are now all in. It is claimed that $1,250,000 gold will be spent by the American Smelting & Refining Co. (which owns 60% of the Velardeña Mining & Smelting stock) on this new plant, which will be of 1,000-ton capacity, but so arranged that it can easily be doubled. W. S. Morse, the general manager of the southern department, is authority for the statement that there are over 800,000 tons of ore blocked out in the company's several mines at Velardeña, and that an unexpected amount of lead ore was being developed, so that the lead would be an important department of the smelter, which it was originally thought would be practically all copper, and the old 200-ton lead concentrating mill of the company will be increased to 500-ton capacity. All the motive power, at both mill and smelter, as well as the handling of slag, matte, etc., will be electric and will come from a 1,200-h.p. central steam generating plant. Besides the automatic sampling of ores there will be also an automatic distribution of ores from the cars directly to the beds. It is reported that E. C. Knight, the present manager of the Monterey plant, will be manager of this new plant. At San Lorenzo, just above the American Smelting & Refining Co.'s new Velardeña plant, the American Mexico Mining & Development Co. has finally thrown out its McDonald hot-blast pyritic furnace, bricked up the crucible of the lead furnace, and now seems to be running smoothly about 50 ton a day and making matte.

In Sonora, the Northern Sierra Madre Mining Co. is preparing to develop its holdings in the Ures district, which comprises two copper properties, the Reina de Cobre and Providencia, and one silver-lead, El Colosus, about 25 miles from the Toledo smelter of the Yaqui River Smelting & Refining Co. The Cieneguita Copper Co., of La Calera, Sahuaripa, is to build three new furnaces and add 200 tons to its concentrating plant. The new furnaces are to be of 60-ton capacity each and are known as the Garretson pyritic converter furnace, in which it is claimed, by some mechanical arrangement and manipulation of the blast, the matte is first formed and then converted to clean copper in the one furnace, which is almost entirely cleaned out after each charge, and the new green charge put into the still hot furnace. It will probably be watched with interest.

London. June 10.

A few months ago I referred to the action taken by the income-tax commissioners in claiming income tax on the whole of the profits of the De Beers Co., their argument being that, though the company was registered in Cape Colony, and its mines were situated there, yet the actual business of the company, that of selling the diamonds and directing operations, was conducted in London. Hitherto, of course, only such shareholders as are resident in England pay income tax on their dividends received from the De Beers Co. The decision of the income-tax commissioners was appealed from by the company, but, as I recorded recently, the judge of the high court upheld the commissioners. The case has now gone before the court of appeal, and the three judges have unanimously confirmed the decision of the court below. There will be an appeal to the House of Lords, as the case is such an important one in its bearings on the company world in general, that it is desirable that the point should be settled for good. I need not here recapitulate the various arguments, as I did so a few months ago. Suffice it to say, at present, that as the court of first instance, and the court of appeal have been quite unanimous, it is easy to see the bent of the legal mind, and to anticipate that the House of Lords will concur.

Dredging for gold, especially in South America, is receiving some attention in England at present. For instance, the Lake View Consols, Ltd., one of the Kalgoorlie, W. A., companies, has taken an interest in a concession on the Inambari river in Peru. Parenthetically, I may mention that many shareholders doubt the wisdom of a company devoted to operating a specific mine in Western Australia, investing its money in propositions of an entirely different nature, situated on the opposite side of the world; but let that pass. The dredging concessions in question were acquired by Messrs. Delvallee and Fuchs, two Continental engineers, and sold by them to a Brussels company, which in turn has formed a company, registered in London, to acquire the properties and raise

working capital in England. The name of the London company is the Inca Gold Development Corporation of Peru, Ltd., and the bulk of its shares are held in Belgium and France. In fact, the investment of £5,000 on the part of Lake View Consols is practically the first subscription of cash made in this country. The move is really not a very important one, but it is worth recording.

Some weeks ago I reported that the British Aluminum Co., having now arranged its finances and its business methods on a satisfactory basis, had once more won the confidence of the investor, and was proposing to issue new capital to extend operations. These arrangements are now completed, and £300,000 in new debentures have been offered to the public. The company was originally started ten years ago, water was obtained from Foyers fall in Inverness, Scotland, and the bauxite obtained from north Ireland. For some years the business was mismanaged, and it was only in 1902 that things began to straighten out a little. The products of the company have now a steady sale, and the capacity of the Foyers works has been reached. For the purpose of extending operations, a new site and water power have been obtained at Loch Leven, in Argyllshire, and it is for the purpose of building and equipping the new works that present issue of capital has been made.

Melbourne. May 12.

The new Chillagoe Railway & Mines, Ltd., is a Melbourne venture owning large leaseholds in North Queensland. It has been the subject of one reconstruction and is on the verge of another—that is, if the public will subscribe the cash. A. Stewart made the original flotation possible by the estimate he gave of the quantity of ore in sight. To the last he believed that he was right and his final fling at the directors was that the properties would come out if properly mined. But the mining has been done and results somehow do not approximate the sampling by a great deal. So there had to be first one reconstruction, and as the company has defaulted, owing to its inability to pay interest, a second reconstruction is now proposed, with the concurrence of the English debenture owners. These lent £500,000 to build a railway from the sea-coast to the mines. Capital is to be written down from 1,000,000 shares of £1 each to 700,000 shares of 10s. each, of which 2s. 6d. will be called up. This will give to the new company ample capital to carry out a plan of operations which has for its object the concentrating of the low-grade ore (of which there are vast supplies), the erection of roasting furnaces, and general mine development. Prospects at the mines are better than they have been, especially at the Zillmanton, but the real hope of the company is to extend its railway from Chillagoe to the Etheridge field—about 100 miles—so as to get the custom of that district. Negotiations on the matter are now proceeding with the Queensland government, but the labor party there does not want private enterprise. The failure of the Chilagoe company has been a most severe blow to a large body of investors both here and in London. A good deal of blame really attaches to the directors for not visiting the district more frequently. But it takes some courage to trip off the best part of 1,000 miles to the tropics.

Bendigo is the brightest spot on the local mining horizon. Not only are the big mines on the Moon line holding their own, but several of the old-timers look like taking a fresh lease of life. This is the case with the Catherine United, and the adjoining properties, and the Princess Dagmar. Then away to the south, on the famous New Chum line, a block of companies are proving the existence of payable saddles beyond the limits to which payable gold was assigned. The fact of the matter is that the whole region has not been half explored. Great interest has been displayed in the correspondence appearing in THE ENGINEERING AND MINING JOURNAL between Mr. Lindgren and Mr. Rickard respecting the genesis of the gold in the saddle formations at Bendigo, but no local scientist appears inclined to enter the arena with any novel contributions.

The report of the Mt. Lyell Mining & Railway Co., for the six months ending March 31, is a splendid tribute to the efficiency of the staff led by Robert Sticht. Smelting costs have been brought down to 13s. 0.39d. per ton, as against 14s. 8.25d. per ton during the preceding six months. Mr. Sticht has been greatly helped in this work by Mr. Dean, who took second position after the retirement of Mr. Beardsley. The financial position shown is exceedingly sound—profits amounting to £145,778 against £125,634 for the preceding six months, while the surplus assets stand at £306,979 against £284,854. The company is pushing ahead with its sulphuric acid works and it will then turn to account a lot of its low-grade pyritic ore.

Johannesburg. May 22.

In some lines American goods have almost disappeared from the Johannesburg market. Today there are very few American winding ropes sold to the mines. The British manufacturers send such a high-class article to this country, and have so firmly established themselves, that it would be almost impossible for newcomers to oust them from their strong position. When a manager gets confidence in a firm of rope-makers, he seldom tries a rope of another make. Winding ropes are of such vital importance on a mine that a man dreads trying a new kind, for fear it will prove a failure. Competition is most keen in the rope business. Realizing how adversely their reputation is affected by the breaking of a rope, manufacturers are careful not to ruin their prospects by supplying an inferior article to the mines. When a rope breaks in a shaft, every one finds out the maker of the rope, and the chances are that the sales of the firm fall off very considerable. Prices paid for first-class ropes vary from 2s. 9d. to 4s. per yard. The 'life' of the ropes on the mines varies a great deal. I have seen a rope from a first-class firm break in a vertical shaft after ten months' service, while another rope of similar dimensions, made by the same firm, lasted two years.

Another line in which the American manufacturers have lost ground in this country is bicycles. They deserved to lose. Before the war, thousands of inferior bicycles were sent to this country and sold at a high price. People began to say that American bicycles were failures, and this reputation still exists. The idea that "anything is good enough for South Africa" must be given up by American manufacturers sending goods to this country, if they want to remain in the South African markets. There is a great field for American products in this country, provided the best is sent out.

Small-pox has broken out in Johannesburg. Vaccination is practically universal along the Rand. All the Chinese laborers were vaccinated before coming to the Rand. Kaffirs also are vaccinated. It does not seem likely that an epidemic will break out, but the fact that the disease has appeared is causing some anxiety.

A good deal of adverse criticism has appeared lately on the subject of mine-managers' certificates in the Transvaal. It is claimed that the mine-owners are able to decide whether a man is competent to run a mine or not, that it is interference on the part of the State to ask a man to pass the A B C of mining before he is allowed to manage a mine. Some declare that the Government should have only the right to examine a candidate in the mining laws and regulations of the Transvaal. There is something to be said in favor of these compulsory examinations. In this country, especially on the Rand, there are few incentives to study. As yet we have no universities, and only fair schools. Many young men, starting life on the mines, would close their books forever, save for the reading of an occasional novel, were it not for the fact that they must pass stiff examinations before they can attain to the positions of surveyors, captains or managers. To pass the examinations the candidate must study diligently for months, and in many cases this preparation establishes the habit of study. Although the examining board may prove a nuisance to a few individuals, I believe it is a useful body, and in the present educational condition of the country it would be unfortunate if the board were abolished.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. A. B. Frenzel is in New York.

Mr. Thomas Hewitson is in London.

Mr. S. F. Emmons sailed on *La Savoie.*

Mr. W. L. Austin has returned from the West.

Mr. Frank K. Borrow has returned to London from Rhodesia.

Mr. J. L. McKenzie, of Vancouver, B. C., is in Mexico.

Mr. F. H. Minard is making examinations in southern Idaho.

Mr. C. W. Kempton has gone to Alaska on professional business.

Mr. Arthur L. Walker has returned to New York from Tacoma.

Mr. R. B. Watson, consulting engineer to the Shannon Copper Co., is in Mexico.

Mr. Thomas F. Walsh is visiting the new discoveries of Timiskaming, Ontario.

Mr. Ernesto Madero, president of the Torreon Metallurgical Co., is in New York.

Mr. E. A. Hobart has resigned as superintendent of the Pittsmont mine in Montana.

Mr. William F. Kett arrived on the *Deutschland* and proceeded to San Francisco.

Mr. J. D. Irving, professor of geology in Lehigh University, was in New York on June 19.

Mr. W. T. Hendrick, of St. Clair, Mich., is making a professional trip in Mexico and Arizona.

Mr. David J. Pullinger, of London, has gone to South Africa, after an extensive trip through Mexico.

Mr. W. R. Feldtmann has been appointed consulting engineer to the Ashanti Goldfields Corporation.

Mr. Paul S. Cauldrey will be married on June 28 to Miss Daisy Bladworth, of Stamford, Connecticut.

Mr. William Magenau is now mine superintendent with the Luna Lead Co., at Deming, New Mexico.

Mr. Fred W. Bradley has been appointed general manager for the Federal Smelting & Refining Company.

Mr. John L. Schofield has been appointed superintendent for the Coronado Copper Mining Co., of Arizona.

Mr. A. Langstaff Johnston, Jr., of Richmond, Va., is inspecting properties in the State of Chihuahua, Mexico.

Mr. Arthur J. Hoskin has been appointed assistant professor of mining in the Colorado School of Mines.

Mr. George F. Beardsley, who has been with the Canadian Copper Co., has returned from Ontario to Oakland.

Mr. Edward K. Judd, editor of *The Mineral Industry,* was married to Miss Ethel C. Newby, of New York, on June 20.

Mr. Henry Lockhart, Jr., general manager of the Yaqui Smelting & Refining Co., Sonora, Mexico, is at San Francisco.

Mr. Charles H. Fulton, professor of metallurgy in the School of Mines, of South Dakota, is visiting New York.

Mr. W. S. Morse, general manager of the Southern department of the American Smelting & Refining Co., is in New York.

Mr. R. S. Perry, of Mexico City, has been appointed assayer for the American-Mexico Mining & Development Co., of Mexico.

Mr. A. V. Bohn, manager of the Brattleboro & Citizens Mining Co., of Leadville, Colo., has returned from a trip to the East.

Mr. John D. Ryan has been chosen president of the Anaconda Copper Mining Co. His former position was that of managing director.

Mr. George L. Emrey, of Bisbee, Arizona, has been appointed mining engineer to the Oro Maximo Mining Co. in the State of Sonora, Mexico.

Mr. R. S. Botsford is visiting British Columbia on his way to London from Borneo, where he has recently completed a three years' engagement.

Mr. Edwin Ball has been appointed general manager for the Tennessee Coal, Iron & Railroad Co., to succeed Mr. Charles McCrery, who has resigned.

Mr. George O. Argall, the son of Mr. Philip Argall, of Denver, was among those who graduated from the School of Mines, Columbia University, on June 14.

Mr. Albert Roberts, superintendent of the St. Ives mine at Goldfield, has been appointed superintendent of the January mine, Goldfield, and will conduct work on both properties.

Mr. Orvil R. Whitaker was married at Denver, on June 19, to Miss Mina Killgore, of Denver. Mr. Whitaker has accepted a professional position at Mapimi, Durango, Mexico.

Mr. Charles A. G. Winther, for many years general superintendent for the Chapman Valve Manufacturing Co., has accepted a similar position with the Roe Stephens Manufacturing Co., of Detroit, Michigan.

Mr. G. B. Wilson, who for several years has been acting as consulting engineer to the Chinese Engineering & Mining Company, Ltd., of Tientsin, China, has returned to the United States and opened offices at Los Angeles, California.

Mr. Henry Sandwith Drinker has been chosen president of Lehigh University to succeed the late Thomas M. Drown. Mr. Drinker is a graduate of the School of Mines at Lehigh, and has been general solicitor for the Lehigh Valley Railroad.

Obituary.

Luther H. Jewell, an American mining man, operating in the Magdalena district of the State of Sonora, Mexico, was recently murdered by robbers and his body burned.

James Mansergh, past president of the Institution of Civil Engineers, and a member of the council of the Institution of Mechanical Engineers, is dead, after a long illness. He was connected with various engineerings works in the United States and Canada.

Societies and Technical Schools.

American Chemical Society.—The 32d general meeting of this society will be held at Buffalo, N. Y., June 22 to 24. Many interesting papers will be read.

Appalachian Engineering Association.—This society, which includes in its scope the States of North Carolina, South Carolina, Tennessee, Kentucky, Virginia, Maryland and West Virginia, has been formed with the following officers: President, F. W. Calloway, Williamson, W. Va.; vice-president, Joseph F. Kent, Wytheville, Va.; secretary, Dr. Henry M. Payne, Williamson, W. Va.; treasurer, N. H. Mannakee, Pikeville, Kentucky.

Trade Catalogues.

We have received from the Joseph Dixon Crucible Co., of Jersey City, N. J., the June number of *Graphite,* which is filled with interesting matter with regard to the graphite products of this company.

The Marine Iron Works, of Chicago, Ill., has issued a supplement to its catalogue No. 16, which contains a few of the many different sizes and types of marine engines and boilers built by this company.

Bulletins No. 145 and 146 of the Stanley G. I. Electric Manufacturing Co., of Pittsfield, Mass., describe and illustrate respectively the S. K. C. type B. O. lighting transformers and the polyphase induction motors.

The Pelton Water Wheel Co., of San Francisco and New York, has issued a handsome catalogue which contains an illustrated description and price-lists of the water-wheels and kindred machinery made by the company.

Catalogue No. 2, issued by the Redwood Manufacturers Co., of San Francisco, Cal., contains notes on the cyanide process by R. Stuart Browne, and describes and illustrates the cyanide plant equipment manufactured by the company.

Bulletin No. 1102 of the Westinghouse Electric & Manufacturing Co., of Pittsburg, Pa., is devoted to the Westinghouse direct-current multiple-arc lamp for 110 and 220 volts. The same company in bulletin No. 1104 describes the Westinghouse portable instruments.

Industrial.

Ira C. Boss has completed the construction of a 10-stamp mill for the Combination Mines Co., in Goldfield, Nev., and is now superintending the construction of two 40-stamp mills for the Old Hundred Mining Co. and the Grand Mogul mine at Silverton, Colorado.

Owing to the demand for portable electric-driven compressors for operating punchers in coal mines, as well as their standard line of compressors, the Herron & Bury Manufacturing Co., of Erie, Pa., has been compelled to double the size of its plant, and expects to take care of its constantly growing business better than ever.

The month of April was one of the largest in the history of the Allis-Chalmers Co. Its sales during that period amounted to about $2,000,000. Next to the two large municipal pumping-engine contracts for the cities of New Orleans and Pittsburg, and the order for the electrical machinery of the San Joaquin Power Co.'s new extension, the most noteworthy sales have been those made of mine machinery destined for South Africa, where the long expected revival of trade subsequent to the Boer War seems now to be making itself felt.

Before installing the blower system of heating and ventilation in their factory at Providence, R. I., Irons & Russell investigated shops using similar systems where benches were located next to outside walls. It was found that the moving air was chilled in passing by windows and traveling across the benches, creating an uncomfortable draft for the bench workers. It was decided to move the benches out about 6 in. from the wall, and to use a small amount of direct radiation to offset the effect and produce a sheet of warm air next to the windows. The result has been very satisfactory. Reducing the indirect radiation to equivalent direct, and adding the direct, the actual ratio of cubic feet of space heated to square feet of radiation is about 80 to 1. The fan for the heating system, which was furnished by the B. F. Sturtevant Co., Boston, Mass., is driven by a 10-h.p. electric motor, with speed regulation giving speeds varying from 100 to 220 rev. per min. on the fan wheel. At the maximum speed, the fan is counted on to deliver 40,000 cu. ft. of air per minute, the fan wheel being about 7 ft. in diameter. There are about 1,250 sq. ft. of heating surface in the heating coils, in five four-row and one two-row sections. The warm air is led through an underground duct to two vertical shafts, and is distributed on each floor through galvanized iron pipes. The fan system is designed to effect six changes of air an hour in the front portion of the building, and four changes in the rear.

General Mining News.

Petroleum Exports.—Exports of mineral oils from the United States in May are reported as below, in gallons:

	1904.	1705.
Crude	3,367,236	10,175,702
Naphthas	784.066	3,407,519
Illuminating Oil	53,172,222	69,759,999
Lubricating Oil	7,127,720	6,720,907
Residuum	4,967,123	5,826,030
Total	69,418,367	95,890,157

May exports were large, showing an increase of 26,471,790 gal., or 38.2% over last year. In the table, paraffin is included in lubricating oils.

ARIZONA.

COCHISE COUNTY.

Paradise Chiricahua Development Co. Work is progressing most satisfactorily. A flow of water, too strong for the pump, was recently encountered, in consequence of which the workings were flooded out for a few days, until a large pump could be installed.

Savage Gold & Copper Co.—Arrangements have been completed for hauling in the smelter, and work will at once be started on a second well. As soon as possible the townsite at the mine will be laid out.

Cochise Consolidated Copper Co.—These mines are being put to work as fast as suitable men can be obtained, and it will be only a short time when they will be running full-handed again. The concentrating plant ordered a short time ago will soon be on the road.

Hans Bros.—On this group a strike was recently encountered in the lowest level, about 100 ft. from the shaft.

Lexington No. 2.—At this property on Whitetail creek good ore has been encountered, and the owner now contemplates opening the ground in a substantial manner.

GRAHAM COUNTY.

Coronado Copper Mining Co.—This working is installing a 25 h.p. gasoline hoist at shaft No. 2. The smaller engine at present in use there is to be removed to the Garnet claim, where the company has started a double-compartment shaft on what is known as the "Big Coronado" vein. John L. Schofield is superintendent.

CALIFORNIA.

AMADOR COUNTY.

Considerable land along Dry creek, 2 miles northwest of Ione, has been bonded and will be prospected for dredging operations.

Bunker Hill Mining Co.—At this mine, Amador City, an electric pump has been put in. The main shaft of the mine is now down 1,500 ft., and prospecting operations are going on upon that level.

Climax.—At this mine, P. B. Aiken, manager, a larger steam pump is being put in, and a larger boiler is being installed for the hoisting works.

CALAVERAS COUNTY.

San Andreas Gold Mining Co.—This company, owning the San Andreas and Dorothy mines, at San Andreas, will commence operating both properties on July 1. The shafts will be sunk to greater depths. The president and general manager of the company is John L. Henry.

KERN COUNTY.

Yellow Aster Mining Co.—At this property, Randsburg, 150 men are on the payroll and the mills are crushing 550 tons of ore daily. Electricity is to be used instead of mules for handling the cars in the tunnel. More power drills have been ordered.

MENDOCINO COUNTY.

Covelo.—Near this place, placer gold mines have been discovered and some large nuggets found. Some hundreds of dollars have been taken out in preliminary work.

NEVADA COUNTY.

North Star Mines Co.—This company at Grass Valley is building a trolley line from the Central to the North Star mine, by which ore may be hauled to mills, cyanide plants, etc., doing away with the horse teaming.

Austin & Wedge.—For this mine near Nevada City, recently bought by Henry Selson, of San Francisco, an air-compressor, two drills and a rock-breaker have been ordered. A 10-stamp mill will be built as soon as developments warrant.

Bullion.—As soon as the electric pumps arrive the water will be pumped out of this mine. The power has been brought in and the motors are in place.

Two Counties.—At this mine (formerly the McKillican) near Moore's Flat, Frank B. Hill, superintendent, a 5-stamp mill is about to be constructed.

RIVERSIDE COUNTY.

Good Hope.—Trujello and Aiken are working a lease on this mine at Perris. The last run of ore averaged $16 per ton. They now have 18 in. of good ore.

SACRAMENTO COUNTY.

Sutter Mining Co.—This property in the Blue Ravine region above Folsom has been a drift mine, but is now to try dredging, although it is about 60 ft. to bedrock.

SAN BERNARDINO COUNTY.

Kane's Springs.—At this place near Soda lake numbers of mining locations have recently been made. In less than a month 200 location notices have been recorded.

Stem Winder Mining & Development Co.—This company has been organized at Redlands to work the Stem Winder mine, 20 miles north of Danby in the Old Woman mountains. A tunnel has been started on the property. C. O. Dempsey is secretary of the company.

SHASTA COUNTY.

Clipper.—R. R. Roper, of San Francisco, who has held an option for some time, has purchased this group near Kennett

in the interests of a syndicate he represents. The group includes the Clipper, Snyder and Last Chance mines.

SIERRA COUNTY.

King Consolidated Mining Co.—R. B. Harper and Mitchell Phillips, of San Jose, recently purchased the property near Sierra City, and have ordered an additional 20-stamp for the mill. Philip Hayes is in charge.

Clover Fork.—Truman S. Clark has applied for a hydraulic mining license for this mine near Downieville, draining into a tributary of the north fork of Yuba river.

SISKIYOU COUNTY.

Golden Eagle.—Ground is being prepared for a new quartz mill at this mine, to be run by electric power.

TULARE COUNTY.

Ada-Jewel.—At this mine, Fountain Springs, a 10-ton cyanide plant is being installed.

Himalaya Mining Co.—This New York company, of which L. Tannenbaum is the principal stockholder, is about to reopen the chrysophrase mine on Deer creek, which has been idle for three years. The company owns three other mines of this gem material, one at Venice Hill and two at Lindsay. T. T. Sullivan has charge of the properties.

TUOLUMNE COUNTY.

Seminole.—A sale of this mine, with all its machinery, is advertised to take place in London, England, on July 13.

Confidence.—This mine at Confidence has come into the possession of L. R. Poundstone.

Draper.—At this mine heavier machinery will soon be installed.

Longfellow Mining Co.—This company has purchased the 10-stamp mill formerly in use at the John Royal mine.

Republic.—A 5-stamp mill has been purchased for this mine on the Stanislaus river, near Parrotts Ferry, and the property is being put in operation.

Harvard Mining Co.—This company is being reorganized, and it is expected that work on the mine will soon be resumed with a large force.

Dondero.—In this placer mine a new gravel channel, 100 ft. wide, has been opened, and some of the gravel shows high yield.

COLORADO.

CLEAR CREEK COUNTY.

Bellman.—A plant of machinery has been installed and regular operations are under way on this property in Gilson gulch. Some very high-grade ores have been shipped and the property will soon ship. C. E. King, Idaho Springs, is manager.

Little Mattie Mining Co.—Pipe for a new water-power line is being built and also getting ready for the wire-rope tramway from the mine to the mill. A shipment of over 100 tons to Idaho Springs sampling works gave net values of over $30 per ton and lessees shipped a lot netting $213 per ton.

Vidler.—An order for the following machinery has been placed by Rees C. Vidler, the manager: One 80-h. p. boiler, air riveted, 10 by 24, Rand cross-compound Imperial type No. 10 Rand drill compressor, model No. 5 water Leyner drills, and other smaller machinery. The new buildings, 125 by 25 ft., are to be erected at the mouth of the tunnel which will run through Argentine pass.

Great Republic.—Georgetown parties are interested in this property in Daily district and have resumed operations, as the snow is all off. Mill runs taken out last fall before operations were suspended showed values of 14 oz. gold per ton.

Puzzler.—Georgetown parties are developing this proup in Daily district, and are going to make some heavy shipments, former shipments of last year giving an average value of $236 per ton in carload lots, the ores showing both good gold and silver values. Minneapolis parties took an option on a one-half interest in the lease and bond which calls for $25,000, and it is believed that the final payment will be made by July 1. William Young, of Georgetown, is in charge, and if the deal goes through a mill is to be built.

Red Mountain Mining & Milling Co.—This company, operating near Georgetown, is going to instal a larger plant of machinery in the near future for the speedier development of its group by tunnel workings.

GILPIN COUNTY.

Old Town Consolidated Mining Co.—Dividends amounting to one-half cent per share, or $15,000, have been declared to the stockholders, making a total of $115,000 inside of the past year. The property is situated in Russell gulch, and at a directors' meeting the following officers were elected: President, W. L. Bush, Idaho Springs; vice-president, J. Ramsey Spear, of Pittsburg, Pa.; secretary-treasurer and general manager, George K. Kimball, Jr., of Idaho Springs.

Victoria-Phoenix Gold Mining Co.—Denver and Eastern parties are interested, having purchased the Crown Point property in Phœnix district. A small shipment of smelting ores gave values of $218.96 per ton, and the company is preparing to instal a plant of machinery, having opened up tungsten ores on its property. Tolland, Colo., is its P. O. address.

Missouri-Colorado Mining Co.—Operations are being resumed under superintendency of T. J. Stroud, of Apex, Colo. Work will include sinking of shaft and running lower levels, and the company figures on building its own mill in the near future.

Town Topics Mining Co.—A contract for new shaft building, 20 by 95 ft., has been let and machinery will be installed on this property in the Lake and Gulch districts, one of the best high-grade producers in the county.

TELLER COUNTY—CRIPPLE CREEK.

Ajax vs. Triumph.—The lawsuit between these two companies has cropped out again. The former company has filed a suit in the District Court against the latter for the possession of certain vein and heavy damages for ore already extracted. There has been a good deal of litigation between these companies for a number of years.

Elkton Consolidated Gold Mining Co.—Reports from the ninth level are very encouraging. While it has not been given out officially, it is understood that ore on the ninth level of the mine is showing up in good shape. Fair shipments are being made.

Isabella Gold Mining Co.—The machinery has been installed on the old Empire State shaft of this property. Work will now be commenced on company account. On the main Isabella workings operations are being carried on by Messrs. Murphy and Hamlin, who have a lease on it. George D. Kilborn, who was formerly manager of the Empire State Gold Mining Co. is in charge.

INDIANA.

Operators and miners are expecting an improvement in conditions in the Indiana coalfields in July. It is usually the case that the storage coal becomes exhausted in July and immediately the coal business begins to improve. The fact is not questioned that the present dullness is due to over-production. The belief is growing that the quantity of coal produced in Indiana will be curtailed and that the recent big mergers in the Indiana coal properties are for the purpose of closing the poorest of the mines, with the production of coal reduced to the actual demand.

The Lynn Coal Mining Co. has about completed its electric-light and power plant near Bicknell. The company intends using the power from its dynamos to run the electric mining machines, and also to furnish light for the mines and for the city of Bicknell. The company is also putting in new hoisting and mining machinery, and is taking the lead in developing the new vein, the product of which is being marked under the name of Indiana Raymond.

The strike which has lasted nearly a month at No. 4 of the Island Coal Co. mine, near Linton, in Greene county, has been settled; the men, tiring of being idle, returned to work on the company's terms.

The Patoka Valley Coal & Coke Co., of Huntingburg, Ind., has filed articles of incorporation with the Secretary of State. The capital stock is $200,000. The company proposes to enter actively into the mining and coking of coal. Charles R. Prill, S. H. Wolfmann and H. L. Klein are the incorporators and directors.

INDIAN TERRITORY.

CHOCTAW NATION.

Degnan-McConnell Coal Co.—This company has purchased the properties of the Mexican Gulf Coal & Transportation Co., consisting of two mines and 100 coke-ovens at Howe, and 50 coke-ovens at Alderson, all on the Chicago, Rock Island & Pacific railway. Messrs. Degnan and McConnell 12 years ago were coal miners, and today they are among the largest coal operators of the Southwest.

Indian Coal & Mining Co.—This company has commenced operations at its mine on a spur of the Chicago, Rock Island & Pacific railway, about two miles north of Dow. It is a slope mine.

MONTANA.

SILVERBOW COUNTY.

North Butte Mining Co.—The articles of incorporation of this company have been filed. The capital stock is $9,000,000, divided into 600,000 shares of the par value of $15 each. The head office is at Duluth, and the incorporators named are Charles A. Duncan, Louis W. Powell and Joseph B. Cotton. A. S. Carson is the Butte representative. The final payment on the Speculator mine was made on June 19.

NEVADA.

LINCOLN COUNTY.

Pioche.—The Janet Mining Co. has started its mill at Pioche, treating 30 tons per day. The ore carries silver, lead and gold. The lead, with some silver, is saved by concentrating tables; the tailing is then subjected to cyanide treatment, the Holderman method of leaching and filtration being used to recover the gold and silver therein.

OREGON.

BAKER COUNTY.

Cornucopia.—Pierre Humbert, Jr., lessee of the Cornucopia mines of the Searles estate, New York, has a large force of men at work testing the extent and value of the property as reported on by himself to a syndicate which stands ready to purchase the mine if the tests prove the value of the property. Humbert is now working under a favorable lease and bond and is prepared to spend $50,000 in experimental work on top of $50,000 already spent in paying off the debts against the property accumulated under the old management.

Mayflower.—The Mayflower mine, adjoining the Searles property, has a force of men working on the lower levels, which tap the ledge of rich ore recently discovered. Manager George W. Boggs is now arranging for the shipment of a mill to be purchased in either Chicago or San Francisco, and which he will have installed and in operation before September. It will be remembered that the orebodies in this mine average $50 to the ton and that the greatest values are saved by cyaniding process, recent tests showing that 95% to 98% of the values can be saved.

Single Standard.—Advices from Marquette, Mich., just received, are to the effect that the stockholders of this mine, who are largely Michigan people, are arranging for the full operation of the property, which is situated about 25 miles east of Baker City, on Paddy creek, and expect to commence work in the near future.

These properties in the Greenhorn district, 40 miles west of Baker City and six miles from the terminus of the Sumpter Valley railway, will be reopened on a larger scale with the beginning of the month. Superintendent Brady has gone East to meet President George W. Daines and arrange for the details of the plans of operation. The two principal properties, the Belcher and the Golden Gate, are now ready for the new mill, which is practically on the ground and will be installed at an early date.

Conner Creek.—The new mill for the Conner Creek mine, 25 miles south of Baker City, has been moved on to the property and will soon be ready for operation. A large amount of ore is stacked up for reduction, and as this is one of the old mines of the county which has produced into the millions in the past, good results are expected this season, as new orebodies have been opened.

UTAH.

BEAVER COUNTY.

Cactus.—The United Metals Co., of New York, has a contract with Samuel Newhouse, of this mine, to handle the metal product of the property for three years.

JUAB COUNTY.

Yankee Consolidated.—The matter of erecting a concentrating mill on this property at Eureka is being considered. Shipments now amount to 600 tons per month of ore, averaging 30% lead and 30 oz. silver. That classed as milling ore runs about 16% lead and 16 oz. silver, and a large tonnage of this grade can be mined. L. A. Amsden is the manager.

SALT LAKE COUNTY.

Boston Consolidated.—Within the month of April, 5,900 tons of copper ore were shipped to the smelters from this Bingham mine. The cost of mining and delivering ore at shipping bins was 83c. per ton.

SUMMIT COUNTY.

Albion.—This is a new property in Alta district, superintended by Wm. Hatfield. A 2,600-ft. crosscut has encountered a 14-ft. vein of ore that runs well in copper, silver and gold.

American Flag.—A one-car shipment of ore from this Park City mine sampled 98 oz. silver and $8.80 gold per ton, with 9.4% lead. It is managed by T. F. Singiser.

TOOELE COUNTY.

Deep Creek.—Duncan MacVichie, manager of the Bingham Consolidated Co., of Salt Lake City, has obtained a two-years' bond and lease on the Gold Hill property in Deep creek district. Development is in progress. Interest in this section is now keen, by reason of the prospective building of the Western Pacific railroad through it.

WASHINGTON.

OKANOGAN COUNTY.

Pinnacle.—J. W. Miller has taken charge of this property and will soon place at work a large force of men. A tunnel will be run to cut one of the main ledges at a depth of 1,200 ft. Operations on the various workings will be pushed, and shipping will be made with the advent of the railroad now being built along the Similkameen valley.

Douglass Mountain Co.—A blind ledge of from 3 to 4 ft. in width has been encountered in the tunnel being driven into this property, and as it is gradually widening and becoming more promising, the company has a double shift now at work developing this ledge. By following the vein, many ledges running at right angles thereto will be crosscut.

Grand View.—The electric plant and 20-stamp mill of this company will be completed within the next month. A number of men are engaged in getting out ore from a 24-ft. vein recently uncovered on one of their claims nearest the mill.

Palmer Mountain Co.—A force of men is constructing a flume on Toats-Coulee creek, which will furnish power for a large electric plant to be constructed by this company.

Triune.—Operations continue on this property. The ledge cut by tunnel is being drifted on in both directions, and the tunnel is being driven to crosscut another ledge some hundred feet distant. The mill is now running, but results are not permitted to be known. The ore appears to be high grade, and it is reported that practically the full value is being saved.

Palmer Lake Mining Co.—This property consists of five claims on west slope of Palmer mountain. North of the Pinnacle mine, several well-defined ledges have been prospected, and a company of Columbus, Ohio, people have recently been organized, under the above name, to develop this property.

Foreign Mining News.

AFRICA.

TRANSVAAL.

The State Mining Engineer's report says that for the month of March there were 26 collieries working in the Transvaal, and the production of coal was as follows: Springs-Brakpan area, 129,770 tons; Middelburg, 135,537; other districts, 22,047; total mined, 287,354 tons. The total coal sold was 218,354 tons. For the three months ending March 31 the total coal sold was 603,860 tons; an increase of 35,971 tons over last year. During

March, 1905, there were two accidents in the Middelburg area, resulting in the death of two persons, and in the Springs-Brakpan area, one person was killed by accident. For other districts one death is reported.

The output of the Transvaal mines for May is reported at 416,000 oz. fine gold. This makes the total for the five months ending with May, 1,948,058 oz. fine gold; an increase of 441,064 oz., or 29.3%, over the corresponding period last year. The May production is the largest ever reported; the highest figure for any month before the war was 459,710 oz. bullion, but that was equivalent only to 378,290 oz. fine gold.

AUSTRALIA.

NEW SOUTH WALES.

The Mines Department reports that the gold output for the three months ending March 31 was 69,906 oz. fine gold.

WESTERN AUSTRALIA.

The Mines Department reports the gold production for May at 157,685 oz., a decrease of 14,451 oz. from May, 1904. For the five months ending May 31 the total output was 810,224 oz. fine gold, showing a decrease of 7,235 oz., or 0.9%, from the corresponding period in 1904. The returns are now made in fine gold, not in bullion, as formerly.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending June 10 were as follows in tons: Granby mines, 11,027; Mother lode, 3,510; Mountain Rose, 132; Oro Denoro, 132; Emma, 132. Total for week, 14,943 tons. For year to date, 410,292 tons.

VANCOUVER ISLAND.

Tyee Copper Co., Ltd.—The smelter ran 8 days, and smelted 1,501 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $23,070. The short run was owing to installation of new machinery.

Mining Stocks.

(See quotations on page 1222.)

New York. June 21.

The stock market has been generally dull, and the buying public is very little in evidence, as the vacation season approaches. Transactions have not been large. Amalgamated Copper closes around $80½; while United Copper sold at $24; Tennessee at $26. The little flurry in the Greene companies is still in evidence, each rally being met by large sales. Greene Consolidated Copper closed at $22, and Greene Consolidated Gold at $4, both above the low points for the week.

The industrials have been dull. American Smelting & Refining is quoted at $112½, with $119¼ for the preferred. United States Steel, with few sales, shows $28⅛ for the common and $94¾ for the preferred.

A little was done in mining stocks on the curb. Guanajuato sold at $4¾, and Tonopah, of Nevada, at $13½. Nothing was done in the Comstocks, and very little in Cripple Creek shares.

A new manifesto from Lawson was threatened, but did not materialize. Perhaps the weather was too hot.

Boston. June 20.

Although it has been quiet in the mining-share list here this week, there has been a particularly strong tone. Greene Copper has been the most active stock, and although it stiffened $1 to $22.50, it is off to $21.75 again. The increase in the Utah Consolidated dividend from $1.50 to $2 semi-annually had a reassuring effect on the stock, which advanced $1.12½ to $45. With this payment a total of $12.14 per share will have been paid on the 300,000 shares in the past four years. The amount paid in is $5, which is the par value. A surprise came to United States Mining stockholders in the declaration of a 75c. dividend. This is dividend No. 3, the other two being 50c. per share. The stock has varied from $28.50 to $29.50. Stockholders of record July 1 are offered 70,000 shares of the recent issue of 100,000 new shares at par $25 in the proportion of one new share for seven owned. The company announces that it has purchased a controlling interest in De Lamar's Copper Refining Co., and the proceeds of this stock will pay for the purchase. As has been remarked here before, this company has plans on hand which will make it an active competitor in the smelting field. Rights of this company have been selling for 30@35 cents.

Calumet & Hecla is up $25 to $635, on 113 shares traded in during the week. There has been a sharp demand for Allouez, which is up $1.50 to $23, and for Michigan, which is up $1.25 to $13.75. It is expected that the Allouez will start to produce about August 1. Copper Range closes the week $1.50 higher at $69.50.

Dominion Coal is up $4 to $80, and Dominion Iron & Steel is up $3.25 to $23.75 on the improved prospects. The announcement that the Phœnix mine had been ordered shut down had no effect on the stock, which is selling around $1 per share. Osceola has been steady around $92@$91.50. Osceola directors are expected to meet for dividend action in a few days. There has been considerable activity in Utah-Apex on the curb, and it advanced to $5. A brokerage house is offering 25c. a share to call 250,000 shares of this stock at $7.50 per share up to July 1, 1906. There are 500,000 shares authorized, although but 485,000 shares are issued.

Colorado Springs. June 16.

Light sales and slightly declining prices were the features of the last week's trading in Cripple Creek stocks on the local mining exchange. El Paso stock has declined from $1.94 of a week ago to $1.82 on today's market. Elkton, which sold the forepart of the week for 40c., was traded in today at 42½@43c. Portland is about the only stock of value which has registered a gain during the week. It sold today for $2.32½. Gold Sovereign is selling for 11⅜c.; Acacia for 9c.; Work for 8½c. United Gold Mines sold during the week at 21c.; Findley at 74c.; Vindicator at 90c.; Isabella, 30¼c. per share.

Salt Lake City. June 17.

The sales on the floor of the Salt Lake Stock and Mining Exchange during the past week aggregated a trifle over $25,000. There was little change in prices, compared to a week ago, and only two stocks showed any material gains; these were: Lower Mammoth and New York Bonanza, the former of the Tintic district and the latter of Park City. The rise in both cases was attributed to an improvement in physical conditions. Mammoth, of Tintic, is shipping regularly again, having concluded a favorable contract with the smelters of Salt Lake City. Preparations are being made to double the present output. There has been considerable inquiry for the stock, but holders are not selling. Consolidated Mercur has been strong, but inactive. A bid for Albion, of Alta, brought forth no response.

San Francisco. June 15.

Ophir had a setback early in the week, but recovered to $7, closing at $6.75. The other Comstocks followed this lead, and there was an easier tone at the close, on moderate sales. Consolidated California & Virginia closed at $1.50; Best & Belcher, $1.10; Mexican, $1.10; Sierra Nevada, 33c. per share.

The Tonopah stocks were quite active, with prices firm, and a good tone to the market. Montana Tonopah brought $2.75; Tonopah Midway, $1.55; Tonopah Belmont, $1.20; Gold Anchor, 73c.; Jim Butler, 77c.; Goldfield, 49c.; Sandstorm, 45c. per share.

Trading in oil stocks was not active, and prices were rather weak. Oil City brought 63c.; Four Oil, 47c.; Chicago Crude, 8c.; Occidental, 4c. per share.

The sworn reports of the mining companies, as filed in their offices this week, show cash on hand June 1 as below, with all expenses paid, unless otherwise noted: Alta, $1,308, with liabilities of $1,200; Andes, $1,436; Alpha Consolidated, $3,412; Belcher, $4,543, with May expenses partly unpaid; Best & Belcher, $151, with indebtedness of $500; Bullion, $3,870; Caledonia, $3,776, with May expenses unpaid; Confidence, $762, with May expenses unpaid; Chollar, $8,593; Consolidated Cali-

fornia & Virginia, $21,655; Crown Point, $8,209; Challenge Consolidated, $223; Consolidated Imperial, $2,558; Exchequer, $378; Gould & Curry, $7,036; Hale & Norcross, $352, with indebtedness of $2,300; Justice, $1,412, with indebtedness of $1,000; Julia Consolidated, $1,430; Mexican, $2,269; Consolidated New York, $1,420; Ophir, $41,564; Overman, $1,836, with May expenses unpaid; Potosi, $7,330; Savage, $2,533; Scorpion, $204; Segregated Belcher, $8; Silver Hill, $14,951; Sierra Nevada, $6,363; Syndicate, $16; Union Consolidated, $6,579; Standard Consolidated (Bodie), $25,081, with May expenses and May clean-up to be accounted for.

Coal Trade Review.

NEW YORK, June 21.

ANTHRACITE.

Trade in anthracite coal is moderately active. The fine coals are dull. Buyers are not endeavoring to take advantage of the extra 10c. as much as before. It is expected that there will be more active demand later, although it is not looked for before the last of August or the first of September. The leading companies have fair orders for egg, stove and chestnut. Steam sizes are not in active demand, and some producers are making concessions.

Prices f. o. b. New York harbor shipping ports during June will remain as follows: Domestic sizes, $4.45 for broken, and $4.70 for egg, stove and chestnut. Steam sizes remain at the same figures as last week; $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice, and $1.30@$1.35 for barley.

BITUMINOUS.

The Atlantic seaboard soft-coal trade shows fairly strong conditions. Orders, though inclined to be sluggish in reaching shippers' hands, have been forthcoming in sufficient quantity to keep the market fairly active, in some cases showing an increase over the previous week. There are no accumulations of coal at any shipping or unloading port and the trade is moving smoothly and in a normal condition. The main-line roads are watching closely the loading ports, and if any accumulation shows unduly, the individual causing it is promptly embargoed at the mines on empties. This close supervision eliminates, to a great extent, speculative coal being shipped on the market and takes this burden off legitimate trade.

Scattering contracts are being closed, but this is merely showing the ending of the contract season. The usual midsummer dullness is being looked for, but the indications at this time are against its immediate occurrence. Trade along the Sound is showing an inclination to increase its taking on of bituminous coal; its interests veering from anthracite to bituminous as the season advances, and the increase in schedule prices on anthracite comes into play.

Trade in New York harbor is fairly strong; the lack of any large surplus at New York harbor shipping ports prevents the speculative element in trade from offering coal at off prices to take trade, thus bearing the market. The quotation on fair grades of steam coal is reported at about $2.40@2.50 f. o. b. New York harbor shipping ports, with gas slack selling at $2.25@2.30 f. o. b. New York shipping ports.

All-rail trade is going forward in a quiet way, the prices maintaining themselves. There is some talk of the New Haven road discontinuing some all-rail business at points on its line and increasing its unloading facilities at its water receiving ports to carry this out.

Transportation from mines to tide continues excellent, the old schedules of time between various mines and tidewater shipping ports being regularly improved upon. Car supply is up to all demands and is controlled to a great extent by the dispatch given at tide, whenever coal arrives there, in discharging cars.

The largest-sized vessels are in plentiful supply, but the smaller ones are not so many. Philadelphia quotes to Boston, Salem and Portland, 65c.; to Sound points, 55c.; to Lynn, 85@90c.; to Newburyport and Bangor, 85c.; to Portsmouth and Bath, 70c.; to Saco, 95c. and towages; to New York harbor, around the cape, 65@60 cents.

Birmingham. June 19.

Coal production in Alabama, despite the season, is still satisfactory and the future prospects are bright for a steady operation at mines. The union miners have prepared their scale of wages and rules governing at mines where the union miner is recognized. It is similar to the wage contract which has been in effect for the past two years. The contract is being submitted this week to the operators. It is not believed the furnace companies will participate in any of the negotiations with the miners, except the Alabama Consolidated Coal & Iron Co. and the Alabama Steel & Wire Co. The commercial operators last week appointed a scale committee to confer with the miners and make a contract for the year, beginning July 1. An official denial is given to rumors that the miners in the employ of the commercial coal companies would be called out in sympathetic strike for the purpose of forcing a contract with the furnace companies.

At the meeting of the miners during the past week the report of the secretary-treasurer of the district organization showed that over $400,000 had been spent through the strike. The national organization contributed to a great extent to the strike fund and is still furnishing a good sum of money. The district treasury has something like $50,000 in it, and W. R. Fairley, Alabama member of the national executive board, announced that assurances of financial and moral aid had been received to continue the strike another year if need be. The convention of miners fixed a heavy fine and expulsion for locals who went out on strike before referring matters in dispute to the district executive board to be passed on. The joint conference between miners and operators began today.

The Alabama Consolidated Coal & Iron Co. is erecting a number of coke-ovens at Lewisburg. The company is also making a number of improvements at the Lewisburg mines. The Merrimac Coal Co. will begin shipping coal soon. A half interest in this concern has been sold to A. E. Colwell, of Lakeland, Fla., and the capacity of the mine will be increased to 500 tons a day. Seventy-five houses for employees will be erected and other work will be done looking to an up-to-date colliery.

BY TELEGRAPH.

Birmingham, Ala., June 21.—The commercial coal operators and the Alabama Consolidated Coal & Iron Co. have renewed the old contract with the United Mine Workers, Alabama district, to take effect July 1. The large iron companies have taken no notice of the convention, and the strike is continued in force at their mines.

Chicago. June 19.

In every line, even to fine coals, midsummer dullness is apparent, as regards sales for immediate delivery. Contract business, however, is said by some dealers to have become better because of the shotfirers' law. The operation of the law begins July 1 and apprehension over its effects on prices has led to many contracts in the last two weeks. It is generally expected that the law will result in a permanent advance in prices of at least 10c. on Illinois coals. A meeting of the operators of the State at Springfield tomorrow will probably define the position of the operators, who are strenuously opposing the proposition that the increased cost of mining due to the law shall be borne by themselves without any change in the wage scale.

The strike conditions in Chicago still curtail business somewhat, but are less potent each week. To all appearances the strike is wearing itself out. It is not acting on the coal trade now to any general extent, but the apprehensions of some customers are yet unquieted. Most of the falling off is due to the usual causes—light manufacturing and the weather.

Lump and large sizes of Western coal are difficult to dispose of; lump brings $1.80@$2; run-of-mine, $1.40@$1.60, and screenings $1.10@$1.40. Hocking continues light and steady at about $3; smokeless is easy at $2.90@$3.15. Eastern coals generally are in better condition than Western as regards sales. Anthracite is in very light demand.

Cleveland. June 20.

The lake coal movement is beginning to be much heavier, due to the shifting of lake tonnage to the coal trade. The movement is not as free as it might be, boats being delayed somewhat at both the upper and the lower lake docks. The rates have not changed, being fairly firm at 30c. to the head of the lakes and 40c. to Lake Michigan points. There is some fairly heavy buying of coal at current prices, with lake three-quarter selling at $1.90 f. o. b. boats at Lake Erie ports.

Steam coal is in a sickly condition, with most of the material being peddled. Prices are weak, with no improvement in sight, holding at 90@95c. at mines, for run-of-mine quality. There is a little better demand for slack, with the commodity scarce. The price is holding at 60c. at mines.

The coke situation is about the same, except that the higher grades of coke have been selling more easily and the supply is not excessive. The prices hold about as they have been, at $2.50@$2.75 for 72-hour foundry coke, and $2@$2.25 for furnace coke.

A report comes that the productive capacity in this territory, which is actively engaged at the present time, is only 35% of the total capacity. This is said to be due to the fact that the facilities for the production of coal have outrun the immediate needs of consumers.

Pittsburg. June 20.

Coal.—Nearly all the mines, both river and rail, are active, but the demand is not improving and prices are easier. The maximum price is based on run-of-mine at $1 a ton at the mine. Heavy shipments are being made to the lake ports for the Northwestern markets, and the empty craft on the river are being loaded for shipment to lower ports on the next rise.

Connellsville Coke.—There is a material falling off in production and shipments of Connellsville coke. Prices remain about the same, furnace coke being quoted at $1.80@$1.90 and foundry at $2.35@$2.50. The production for the week was 249,916 tons, a decrease of about 4,000 tons, compared with the previous week. The shipments aggregated 11,067 cars distributed as follows: To Pittsburg and river points, 4,260 cars; to points west of Pittsburg, 5,638 cars; to points east of Everson, 1,169 cars. This was a decrease of 940 cars.

San Francisco. June 15.

Mr. J. W. Harrington's circular of this date says: "Since our last, only two cargoes of Australian coal have been received; total, 4,905 tons. But few vessels are being added to the chartered list of coal from Newcastle, which now numbers 23 vessels with a carrying capacity of about 66,000 tons; three of these vessels should arrive this month, and some of them will not leave for several months yet. The stock of coal now in yard here of all grades is exceptionally small, but as the present demand is very light, it seems to be ample for all immediate requirements. During the month of May the total deliveries from Newcastle, N. S. W., were 7,145 tons; from British Columbia, 26,596 tons; from Seattle and Tacoma, 10,985 tons; Coos Bay, 5,596 tons; from Japan 5,200 tons. The total is 27,800 tons less than in May, 1904. The selling prices here remain unchanged, as the summer weather now at hand has diminished the consumption of all domestic coals, and fuel oil is being utilized by over 75% of those requiring fuel for steam uses. The labor disturbances at present existing in British Columbia may lead to the closing down of one of the principal collieries there belonging to the Western Fuel Co.; this will not materially affect the local conditions here, as the other collieries there can freely supply our demand."

For Coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, $8; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, $8.50. Eastern coals are nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

Foreign Coal Trade.

June 21.

Imports of fuel in France for the three months ending March 31 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal	2,774,760	2,383,660	D. 391,100
Coke	413,590	371 340	D. 42,250
Briquettes	138,240	106,350	D. 31,890
Total	3,326,590	2 861,350	D. 465,240

The coal was chiefly from Great Britain and Belgium; the coke from Belgium and Germany. Only 260 tons of coal were received from the United States.

Exports of fuel from France for the three months ending March 31 were as follows, in metric tons:

	1904.	1905	Changes.
Coal	269,500	466,500	I. 197,000
Coke	31,241	67.320	I. 36,079
Briquettes	21,197	11,390	D. 9,807
Total	321,938	545,210	I. 223,272

The principal exports were to Belgium and Switzerland.

Imports of fuel into Germany for the four months ending April 30 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal	6,011,604	5,413.723	D. 597,881
Brown coal	6,635	6 300	D. 335
Coke	905,801	798,057	D. 107,744
Total	6,924,040	6.218,080	D. 705,960

The chief exports of coal were to Austria and Holland; of coke, to France. There were 6,863 tons of coke sent to the United States.

Imports of fuel into Germany for the four months ending April 30 were as follows, in metric tons:

	1904.	1905.	Changes.
Coal	1,863,348	3,235,416	I. 1,372,068
Brown coal	2,566,707	2,669,995	I. 103,288
Coke	175,474	246,584	I. 71,110
Total	4,605,529	6,151,995	I, 1,646,466

Imports of coal were chiefly from Great Britain; of brown coal, or lignite, from Austria. The increase in imports was due to the strike of the coal miners.

Exports of fuel from Great Britain for the five months ending May 31 were as follows, in metric long tons:

	1904.	1905.	Changes.
Coal	18,360,879	19,064,304	I. 703,425
Coke	268,412	267,179	D. 1,233
Briquettes	531,019	441,417	D. 89,602
Total	19,160,310	19,772,900	I. 612,590

In addition to these exports there were sent abroad for the use of steamers engaged in foreign trade, 6,768,817 tons of coal in 1904, and 7,015,698 tons in 1905; an increase of 246,881 tons.

The exports to the United States, included above, were as follows for the five months:

	1904	1905.	Changes.
Atlantic ports	21,203	16,443	D. 4,860
Pacific ports	55,493	34 660	D. 20,833
Total	76,796	51,103	D. 25,693

There was a considerable decrease this year.

Iron Trade Review.

NEW YORK, June 21.

Conditions in the iron market continue practically unchanged. Dullness is the general rule, and there are indications of some apprehension as to the future found in the closing down of furnaces, which is going on through a large part of the Central West. The United States Steel Corporation, which recently had every available furnace running, has now 12 out of blast, and eight independent furnaces in the Mahoning and Shenango valleys are also shut down. Notwithstanding this, it is reported that bessemer iron is accumulating at some of the furnaces. The Steel Corporation, under these circumstances, is not expected to buy any outside iron.

In finished material new business continues rather scarce, except in structural steel, which is selling at a very fair rate, chiefly in a small way. In fact, conditions are rather mixed, since the structural people, the car-builders, and the ship-builders have orders which will consume a great deal of material, though much of this has already been contracted for.

Briefly it may be said that the present condition is a waiting one, and that it is more the result of sentiment than of actual conditions. The feverish activity of the first part of the year has given way to hesitation, and it is not unlikely that this will last through the usually dull summer season. That it is permanent is not probable.

There is considerable talk of export

trade, but very few facts that can be actually given. Large orders from Russia are rumored, but facts are scarce.

Birmingham. June 19.

Orders yet unfilled, placed several months since, are being rushed, upon request. The inquiries indicate that there will shortly be some extensive buying. Shipments are not equal to the production in Alabama. The furnaces in blast are doing well. No. 6 furnace at Ensley, the latest furnace of the Tennessee Coal, Iron & Railroad Co., one day during the past week produced 403 tons of iron, the largest amount of iron ever made at a single furnace in this State. The Woodward Iron Co. has the new furnace at Woodward completed and in a few days the torch is to be applied. This furnace will have a capacity of more than 300 tons a day. The furnace-men are still sanguine that there will be active buying as July approaches. There is no fear of an accumulation in this district, despite the fact that some iron is going to the yards.

The following quotations are announced: No. 1 foundry, $12.50; No. 2 foundry, $12; No. 3 foundry, $11.50; No. 4 foundry, $11; gray forge, $10.50@$11; No. 1 soft, $12.50; No. 2 soft, $12@$12.50.

There is great activity in steel. The statement is officially made that the Tennessee Coal, Iron & Railroad Co. has made sales already amounting to 50,000 tons, delivery next year. It is not improbable that before another two months this amount will be more than doubled. Work is on, making improvements at the steel plant at Ensley looking to a larger output. The greater portion of the steel is going into rail.

Chicago. June 19.

There is no relief for sellers of pig iron from the conditions of small sales, declining prices and antipathy to long-time contracts, that have been on the trade for the last two to three months. The user of iron evidently is buying from hand to mouth, but he as evidently is satisfied to wait for a turn in the market before he contracts for more iron than he needs immediately. A falling market never has been known locally to produce large sales, and both sides are in a waiting mood. When the turn comes, however, it is likely to benefit Southern furnaces more than Northern. The Southern agents are making desperate efforts to sell; Northern interests have the bulk of the business for deliveries in the next six months, and Southern is largely dependent on the 30 to 60 days' business.

It is difficult to say what prices are really being obtained for iron. On desirable orders Southern can probably be bought for less than $12.50 Birmingham—$16.15 Chicago. Sales are hinted at on a base price of $12 Southern. Northern is somewhere around $16.50. Large orders are imaginary quantities now; everybody who buys wants a little in a hurry.

The best-informed men of the trade see little prospect of a revival before September, though admitting that the unexpected seems to happen more frequently in the iron business than in almost anything else.

Cleveland. June 20.

Iron Ore.—The movement of ore down the lakes continues to be brisk, the shortage of boats, caused by the shifting of tonnage into the coal trade, being virtually without effect on the amount handled over Lake Erie docks. The rates have remained stable at 75c. from the head of the lakes; 70c. from Marquette, and 60c. from Escanaba. There is as yet but little inquiry for new ore, most of the buyers preferring to await developments in the iron trade. Prices hold at $3.75 for bessemer Old Range; $3.50 for bessemer Mesabi; $3.25 for non-bessemer Old Range, and $3 for non-bessemer Mesabi.

Pig Iron.—The bessemer basic and malleable markets show signs of nervousness. Furnaces are now using the new supply of high-priced ore and in addition are facing the higher cost of labor. The market, on the other hand, is shaky, with a downward tendency. Any strong attack against prices might weaken them. On the other hand, a buying movement would start prices upward. Sales have been made at $14.75 in the Valleys, with prices ranging from $14.75 to $15, indicating the market status. Foundry iron is weak, with few inquiries, and most of them nominal, and no buying to speak of for last half delivery. The price ranges about $15 to $15.50.

Finished Material.—The market shows a more cheerful sentiment, but little additional business. Sheets are stronger, in anticipation of a shut-down, due to labor difficulties in the Valleys. Bar iron is stronger, owing to better buying on account of possible closings for the midsummer repairs. But the strongest feature of the market is the fact that many of the contracts taken at lower prices are now expiring, and consumers are showing no hesitancy to come in and cover their needs for the ensuing six months at the current quotations. Additional strength is given to the situation by the enormous demands for structural material, which is coming from the shipyards and Cleveland building contracts.

New York. June 21.

The iron market continues quiet in most lines. The only department in which much new business is apparent, is the structural.

Pig Iron.—Foundrymen are taking little iron just now, though they are generally busy. Northern iron is nominally unchanged, with light sales. Southern is down to a basis of $12, Birmingham, for No. 2 foundry. Reports of sales below that figure are contradicted.

For Northern iron, in large lots, we quote: No. 1X foundry, $16.75@$17.25; No. 2X, $16.25@$16.75; No. 2 plain, $15.75@$16.25; gray forge, $14.50@$15. Sales have been nearer the lower than the higher limit. Virginia foundry has been held at $17.15@$17.65, but with no sales the price is purely nominal. For Southern iron, large lots on dock, we quote: No. 1 foundry, $16.25@$16.50; No. 2, $15.75@$16; No. 3, $15.50@$15.75; No. 4, $15@$15.25; No. 1 soft, $16.25@$16.50; No. 2 soft, $15.75@$16; gray forge, $14.25@$14.75.

The warrant market on the Produce Exchange still remains quiet. Latest sales have been on a basis of $14.40 bid, $15 asked, June, July and August delivery, for regular warrants; $15 bid, $15.50 asked, same deliveries for foundry warrants.

Bars.—Bar iron is selling in a retail way only. Quotations are nominally the same, 1.595@1.645c., large lots on dock. Steel bars at 1.645c. Store trade is fair, with quotations 1.75@2c. delivered.

Plates.—Plates are in demand in small lots. Tank plates are 1.745@1.795c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.645c. up, according to width.

Structural Material.—Considerable business is going; large orders are said to have been placed, generally on private terms. Small orders are in evidence, and jobbers are busy. There is no quotable change. Beams under 15-in. are 1.745c. for large lots; over 15-in., 1.845c.; angles and channels, 1.745c., tidewater delivery.

Steel Rails.—No change in standard sections. Some orders for trolley rails are going. Light rails are quiet, prices ranging from $21 for 35-lb., up to $24.50 for 12-lb. rails.

Old Material.—The market is dull, for the most part, and dealers are inclined to take offers as they come. No. 1 railroad wrought can be had for $15.50@$16.50; No. 1 yard wrought, $14.50@$15; machinery cast, $13@$13.50. There is a demand for heavy steel melting scrap, and sales have been made at $14@$14.50, with $15 reported for a special lot. These prices are on cars, Jersey City, or other terminal delivery.

Philadelphia. June 20.

The pig-iron situation has been affected by the disappearance from the market of a number of buyers who made inquiries two weeks ago, out of which business was expected. The belief is that certain large consumers, who had about made up their minds to buy, have suddenly concluded that they can delay purchasing with safety and with profit. Very little business has been done for several days past, but the tone of the market is strong, so far as indications are reported by the small inquiries and small sales from day to day. The furnaces are so well oversold that there is no apprehension felt. It is not

known that there is a single furnace in our territory that is anxious for business. Furnace owners have confidence in the market, and they believe that there will be a sufficient volume of new requirements opening up during this summer to keep the situation altogether in their favor. The claim is made by some of our people that the inquiries which have recently been made, but apparently withdrawn, will soon reappear, and that large transactions will be announced. Inquiries made within a day or two as to Southern iron show that prices are firm, and that there is not the slightest possibility of a reaction. Basic iron is strong, bessemer is far oversold; forge-iron contracts are sufficient to keep the furnace people satisfied, and foundry is quiet, but strong. Quotations for No. 1X foundry are still given out at $18; No. 2X foundry at $17.25; No. 2 plain at $16.50; gray forge, $15.50, and basic $16.

Bars.—Notwithstanding there is no change in the card rates, there are instances where good-sized orders for common iron have been taken at a trifle below the usual rates. This is no sign of weakness, because the big buyers of common iron are always favored. There is no surface indication of any weakness, and all of our mills are running to full capacity. Refined iron is held at 1.63½c.

Skelp Iron.—The makers of skelp iron have been endeavoring to gather in some orders and have succeeded in two or three instances, but they had to offer a strong inducement.

Sheets.—The card rate continues at 2.30 for 20-gauge up to 2.70 for 28-gauge. The demand is about as it has been and the manufacturers report market conditions altogether in their favor.

Merchant Steel.—Our shops are working up a good deal of merchant steel and are buying only as they need, and in a small way.

Pipes and Tubes.—Pipe is active and boiler tube is selling fast, the consumption in this territory being even heavier than it has been for months past. Inquiries for tubes for future delivery do not draw out any disposition to make concessions.

Plates.—There is a steady run of orders, most of them lately rather small for immediate delivery, and within a few days there has been a showing for big business for early autumn delivery, but the intending buyers think themselves entitled to some concessions from existing quotations. The mills are too well sold up to entertain any propositions to furnish material cheaper than at present prices.

Structural Material.—There is a good deal to be said in regard to structural material, though the mill people decline to give specific figures as to the orders they are now booking. The American Bridge Co. has been buying heavily and is at present engaged in negotiations for bridge material on Western railroads. The demand for small lots for general construction purposes is an encouraging feature at present. Quotations for beams, channels and angles are 1.73½@1.75, and for small angles 1.65@1.68.

Steel Rails.—The steel rail situation is improving and orders continue to roll in, the demand for girders being quite a feature.

Old Rails.—Old iron rails are held as high as $19.50, but no business has been heard of this week.

Scrap.—No. 1 steel scrap is selling at about $14.25; choice railroad scrap brings $15.50 as fast as it can be had; machinery scrap is dull at $14.25, and No. 1 yard scrap is wanted at $14.50, with $15 asked.

Pittsburg. June 20.

The most important transaction in pig iron this week was the sale of 2,000 tons of bessemer iron at the lowest point reached, $14.75, Valley furnace. Some small lots are reported to have been sold at $15 and a shade less. Foundry and gray forge also are weak, and Southern foundry No. 2 is quoted in this market at $12, Birmingham, or $16.35, Pittsburg. This is a drop of 50c. a ton in Southern iron within two weeks and $1.50 a ton since May 1. Production of pig iron in the Pittsburg and Valley districts continues to decline, and at the opening of the week it was reported that the United States Steel Corporation had 12 furnaces out of blast, while 8 independent furnaces are idle. Bessemer iron is accumulating at some of the furnaces in the Valleys and it is estimated that from 75,000 to 100,000 tons will be piled about the end of this month. The leading interest seems to be restricting its production to its actual requirements. Three of its bessemer steel plants are idle, but operations are to be resumed at one of them in a few days. The idle plants are at Columbus, Wheeling and New Castle. Some additional tin-plate plants have been closed within the past few days and several others are expected to go out this week. The structural and plate mills will continue in steady operation throughout the year. These are the only lines in which new business of any consequence is being booked and most of the mills are several months behind in deliveries. A number of contracts for steel rails have been placed within the past 10 days and aggregate about 50,000 tons. While there is an apparent dullness in most of the finished steel lines so far as new business is concerned, consumption in merchant pipe, wire products, sheets and tin-plate is reported to have increased within the past few days. This is accounted for by the fact that heavy stocks in these lines have been drawn upon to supply the demand.

The settlement of the iron wage scale by the Republic Iron & Steel Co. with the Amalgamated Association of Iron, Steel & Tin Workers is evidently satisfactory to the independent interests. This is indicated by the reports of Amalgamated lodges from all over the country, which show that the iron mills are being operated to capacity, except in some instances where complaint is made of a scarcity of puddlers. According to these reports, which are regarded as official, most of the iron mills will be run during the hot months with only a brief shutdown for necessary repairs. This is the view taken by the men, but it is also probable that the unusual activity is due to a desire on the part of the independent manufacturers to turn out as large a product as possible before the new wage scale becomes effective on July 1.

The American Sheet & Tin Plate Co. has not made any effort to arrange a conference with the Amalgamated Association on the sheet and tin-plate scales. It is customary for the independents to accept the settlement made by this company. The delay occasioned a suspicion that the company does not intend to negotiate with the association, but proposes to close its union plants and, when ready to resume, will attempt to do so on a non-union basis and ignore the association. Unless a settlement is reached before June 30 the independents will either be compelled to close their plants or sign the Amalgamated scale, which calls for an advance of 18% on the sheet and 22% on the tin-plate scale. A meeting of independent manufacturers who recognize the Amalgamated Association was held here on Wednesday, at which the situation was discussed and a committee was appointed to arrange a conference with the association. It was decided to meet tomorrow, and the session likely will continue for several days. There is considerable opposition to the terms proposed by the workers' organization, and some radical concessions must be made by the association in order to reach an agreement.

Pig Iron.—A sale of 2,000 tons of bessemer iron was made at $14.75, Valley furnace, and several small lots sold at $15 and less. Prices of all grades of pig iron are lower this week, and a still further decline is expected before conditions improve. A revival, however, is not likely to occur before the latter part of July. Quotations are as follows: Bessemer, $14.75@$15, Valley furnace; foundry No. 2, $15.60@$15.85, Pittsburg; gray forge, $15@$15.10, Pittsburg.

Steel.—There is not much doing in the billet market, and the few small sales made are close to the pool price of $21. For second-half delivery it is believed $22 could be done, for both open-hearth and bessemer billets. Sheet-bars command a premium of about $2 over the pool price of $23. Plates are firm at 1.60c. and merchant steel bars at 1.50c.

Sheets.—The sheet market is weak, and prices are about $2 a ton less than the rate established by the leading producer.

No. 28 gauge black sheets can be had at 2.30c. and galvanized at 3.35c.@3.45c.

Ferro-Manganese.—Prices remain unchanged, domestic 80% being quoted at $49@$50 per ton.

Cartagena, Spain. June 3.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that the shipments for the week were three cargoes, 9,150 tons manganiferous ore, and one cargo, 2,150 tons dry ore, to Great Britain; 22 tons dry ore to Hamburg. The market is quiet. Shipping rates continue low, 5s. 6d. having been made to Middlesborough and 5s. 9d. to Glasgow.

Quotations for ordinary 50% ore are 6s. 3d.@6s. 6d.; special low phosphorus, 6s. 10d.@7s. 6d.; specular ore, 58%, 9s. 6d.; S. P. Campanil, 9s. For manganiferous ores quotations vary from 9s. 9d. for 35% iron and 12% manganese, up to 14s. 6d. for 20% iron and 20% manganese.

Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton. No shipments reported.

Chemicals and Minerals.

NEW YORK, June 21.

Trade remains active, with no change in prices.

Copper Sulphate.—The price remains unchanged at $4.80, with slightly more for small lots.

Acids.—The market continues strong.

Nitric acid, 36°, 100 lb	$5.00
38°, 100 lb	5.25
40°, 100 lb	5.50
42°, 100 lb	5.75
Oxalic acid, com'l, 100 lb	$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk, ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66°, bulk, ton	21.00@23.00

Sulphur and Pyrite.—Prime sulphur is quoted in New York, Boston and Portland at $20.50; in Philadelphia and Baltimore at $20.75. Pyrite continues unchanged at 10@11 per unit of sulphur for lump ore, and 8.5@10.5 for fines f.o.b. Atlantic ports.

Nitrate of Soda.—Spot is quoted at $2.41@$2.50 for 96%, and $2.35 for 95%. Contracts can be fixed due monthly, July to December inclusive, at $2.27½ for 96% and $2.22½ for 95%; monthly from December inclusive, 1906, for $2.15 for 96%, and $2.10 for 95 per cent.

Sulphate of Ammonia.—Gas liquor is quoted at $3.10@$3.15 per 100 lb., or a shade less for large orders.

Sicilian Brimstone Market.—Messrs. Emil Fog & Sons, of Messina, write, under date of May 31, as follows: After several months of continuous favorable returns, some reaction might have been expected in the statistical position, end of April. Still, this continues favorable. Total exports in April were 73,301 tons. Exports to Italy again increased by about 6,000 tons, while exports to United States decreased only to 8,338 tons, against 17,200 tons in the preceding year. After eight months of quietude, the Louisiana mines are resuming new activity—the wells and engines were increased; but despite this augmentation in the domestic production, prices are still maintained, New York quoting $21; Baltimore and Philadelphia, $21.25; Portland, $21.50. The use of sulphur in the United States is certainly increasing immensely. Shipments to Europe from Louisiana are again resumed. A cargo of 1,000 tons was dispatched for Hamburg; another one is offering for Trieste. We quote: best unmixed seconds in bulk, 80/9; current thirds in bulk, 71/9; best thirds in bulk, 75/; refined block sulph. in bulk, 87/3, per ton of 13 Sicilian cantars f.o.b. Refined block sulph. in bags, 89/9; refined roll sulph. in bags, 93/; sublimed flowers, pure, in bags, 104/; refined roll in strong 3 cwt. cks., 97/; sublimed flowers, current, in bags, 98/9; refined roll in cases of 50 kg., sublimed flowers, commercial, in bags, 92/; and sticks of unusual size, 102/3; best seconds ground, in bags, 87/6; by sticks of small size, 104/, per ton of 20 cwt., f.o.b., gross in bags, net in casks or cases.

Phosphates.—The trade in phosphates continues extremely active. Sales of high-grade Florida for this year up to May 1 exceed those of the corresponding period of 1904 by 50,000 tons. Prices remain unchanged.

Messrs. J. M. Lang & Co., of Savannah, report that shipments of high-grade phosphate rock for the month of May amounted to 182,810 tons.

Phosphates.	F. o. b.	C. I. F. Gt. Britian or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.35@4.40	10.27@10.67
78%	3.75@4.00	.....
75%	3.40@3.50	.....
68@72%	3.00@3.25	.....
‡So. Car. land rock	3.75@4.00	.....
river rock	3.50@3.75	6.33@ 6.61
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr.	.....	11.39

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Liverpool. June 7.

Joseph P. Brunner & Co. report that there is no special feature to note in the position of heavy chemicals, and while prices are steadily maintained, there is only a moderate export demand experienced.

Soda ash is in fair request at the usual varying prices as to destination. For tierces, nearest values may be called about as follows: Leblanc ash, 48%, £5 to £5 10s.; 58%, £5 10s. to £6 per ton, net cash; ammonia ash, 48%, £4 5s. to £4 10s.; 58%, £4 10s. to £4 15s. per ton, net cash; bags 5s. per ton under price for tierces.

Soda crystals are firm at £3 7s. 6d. per ton, less 5% for barrels, or 7s. less for bags; with special terms for a few favored markets.

Caustic soda is quiet, while prices are unchanged, as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10s. 5s.; 76%, £10 10s. per ton, net cash. Special quotations for export to the continent and a few other export quarters.

Bleaching powder is rather slow of sale, and hardwood is nominally quoted at from £4 10s. to £4 15s. per ton, net cash, as to quantity and market.

Chlorate of potash is quoted at from 3 1-16d. to 3 3-16d. per lb., net cash, as to quantity and market, but makers are practically off the market for the present, being sold out to their allowed quantity.

Bicarbonate of soda in demand at £6 15s. per ton, less 2½% for the finest quality in one cwt. kegs; with usual allowances for larger packages; also special terms for a few favored markets.

Sulphate of ammonia in rather better request and firm at £13 to £13 2s. 6d. per ton, less 2½%, for good gray 24-25% in double bags f. o. b. here.

Nitrate of soda is moving off to a moderate extent on spot at £11 2s. 6d. per ton, for ordinary, up to £11 7s. 6d. per ton for refined, for double bags f. o. b. here, less 2½ per cent.

Metal Market.

New York, June 21.

Gold and Silver Exports and Imports.

At all United States Ports in May and Year.

Metal.	May.		Year.	
	1904.	1905.	1904.	1905.
Gold Exp	$43,069,053	$ 481,570	$66,926,849	$35,890,708
Gold Imp	10,472,582	2,656,803	42,877,493	14,460,062
Gold Exc	E. $32,596,471	I. $2,175,233	E. $24,049,356	E. 21 340,646
Silv. Exp	5,098,013	5,426,590	21,957,065	20,336,641
Silv. Imp	1,983,360	3,767,169	11,023,199	12,842,401
Silv. Exc	E. $3,114,653	E. $1,659,421	E. $10,933,866	$7,494,240

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending June 17, and for years from January 1.

Period.	Gold.		Silver	
	Exports.	Imports.	Exports.	Imports.
Week	.....	$76,131	$507,076	$32,920
1905	33,118,146	5,344,890	14,815,651	1,752,709
1904	63,535,915	3,307,807	19,350,009	397,790
1900	14,978,434	2,969,404	8,291,379	1,034,329

The exports of silver were nearly all to London; imports, both of gold and silver, were from Mexico and the West Indies. No gold was exported during the week.

Exports of merchandise from the United States in May were valued by the Bureau of Statistics of the Department of Commerce and Industry at $123,942,789; an increase of $34,055,864 over May, 1904. For the five months ending May 31 the statement is as follows:

	1904.	1905.
Exports	$580,501,231	$619,964,753
Imports	427,180,318	397,197,202
Excess, exports	$153,320,913	$222,767,551
Add excess of exports, silver	.....	7,494,240
" " " " gold	.....	21,340,646
Total export balance	.....	$251,602,437

The movement of gold and silver in detail will be found in the table at the head of this column.

The statement of the New York banks —including the 53 banks represented in the Clearing House—for the week ending June 17 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discount	$1,049,689,800	$1,104,860,900
Deposits	1,122,012,500	1,140,284,800
Circulation	38,752,800	47,359,000
Specie	236,366,300	205,857,400
Legal tenders	83,006,700	86,423,300
Total reserve	$319,373,000	$292,280,700
Legal requirements	280,503,125	285,071,200
Balance surplus	$38,869,875	$7,209,500

Changes for the week this year were increases of $15,340,000 in loans, $364,700 in specie, $1,130,200 in legal tenders, $16,-452,000 in deposits and $783,900 in circulation; a decrease of $2,618,000 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
New York	$205,857,400	.....
England	190,588,305	.....
France	572,412,585	$221,588 335
Germany	201,900,000	67,300,000
Spain	74,080,000	110,385,000
Netherlands	33,919,500	31,082,500
Belgium	16,113,335	8,056,165
Italy	112,225,000	18,192,000
Russia	524.515,000	31,865,000
Austria	238,505,000	65,430,000

The returns of the Associated Banks of New York are of date June 17 and the others June 15, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

Shipments of silver from London to the East for the year up to June 8 are reported by Messrs. Pixley & Abell, as follows:

	1904.	1905.	Changes.
India	£5,117,813	£3,275,871	D. £1,841,942
China	126,062	502,968	I. 376,906
Straits	58,103	2,800	D. 55,303
Totals	£5,301,978	£3,781,639	D. £1,520,339

Exports for the week were £244,000 to India. Imports were £69,000 from New York and £5,000 from Australia; £74,000, all bar silver.

Indian exchange has hardened, under the influence of buying for Chinese account, of bills to pay for Indian cotton. The Council bills offered in London were taken at an average of 16d. per rupee. There has been some buying of silver for Indian account.

The silver market has been steady to firm, with good demand for all offerings. A French tender has given tone to the market which, at the moment, is slightly above the India quotation.

The United States Assay Office in New York reports receipts of 146,000 oz. of silver for the week.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.45½	$0.47½
Peruvian soles and Chilean pesos	.42	.45
Victoria sovereigns	4.86	4.87½
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

June	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Tin, Cts. per lb.	Lead. Lead, Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
15	14¼ @14⅜	14⅝ @14¾	65 7/8	30¼	4.50	5.20 @5.25	5.05 @5.10
16	14¾ @14⅞	14⅝ @14¾	65 7/8	30¼	4.50	5.20 @5.25	5.05 @5.10
17	14¾ @14⅞	14⅝ @14¾	....	30¼	4.50	5.20 @5.25	5.05 @5.10
19	14¼ @14⅜	14⅝ @14¾	65¾	30⅜	4.50	5.20 @5.25	5.05 @5.10
20	14¾ @14⅞	14⅝ @14¾	65 7/8	30⅜ @30½	4.50	5.20 @5.25	5.05 @5.10
21	14¾ @14⅞	14⅝ @14¾	66	30⅜ @30½	4.50	5.20 @5.25	5.05 @5.10

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. Cathodes are usually 0.25c. below the price of electrolytic.

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
15	4.87	58¾	27 1/16	19	4.87	58⅛	27
16	4.87	58¾	27 1/16	20	4.8710	58⅛	27
17	4.8695	58¾	27⅛	21	4.87⅛	58⅛	27⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine

Copper.—There has been no change in the market since our last issue. A steady business is doing, both for home trade and export, and prices are well sustained. The quotations at the close are 14¾@14⅞ for lake; 14⅝@14¾ for electrolytic in cakes, wirebars or ingots; 14⅜@14½ for cathodes and 14¼@14⅜ for casting copper.

The standard market is practically unchanged, fluctuating the entire week between £65 15s. and £66. For refined and manufactured sorts we quote: English tough, £68 10s.@£69; best selected, £70 10s.; strong sheets, £78; India sheets, £74; yellow metal, 6⅜d. Copper statistics show a decrease of 1,000 tons.

Exports of copper from New York and Baltimore for the week ending June 17 were 4,174 long tons. Imports reported for the week were 65 tons of copper.

Tin.—The London market has shown a great deal of strength throughout the week, and closes firm at £139 for spot and £137 10s. for three months. Our market, on the other hand, has not shared in the improvement abroad to the full extent, the consumers being afraid of present prices and buying only from hand to mouth. We quote at the close 30⅜@30½c.

Lead.—Prices are unchanged at 4.42½c. St. Louis and 4.50c. New York, and some business is doing from day to day.

The London market continues firm at £13 for Spanish and £13 1s. 3d. for English.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is strong at 4.47½@4.50c. for Missouri brands.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 3, that the price of silver has been 14.05 reales per oz. Exchange is 33.16 pesetas to £1. Local quotation for pig lead has been 69.05 reales per quintal, which is equal, on current exchange, to £11 13s. per long ton, f. o. b. Cartagena. Shipments for the week were 1,430 tons argentiferous lead to London, 300 tons desilverized to Amsterdam, and 130 tons desilverized to Marseilles.

Spelter.—The consumers are taking a great deal more interest in the market, and a very satisfactory business has been done at slightly higher prices. Quotations at the close are 5.05c.@5.10c. St. Louis and 5.20c.@5.25c. New York.

The London market is steady, and closes for good ordinaries at £24, and specials £24 5s.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is quiet but firm. The nominal value is 5.10c. East St. Louis.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 3, that the market is still rather depressed. Prices continue nominally 75 fr. per ton for blende, 35% zinc, and 45 fr. for calamine, 30% zinc. Shipments for the week were 250 tons blende to Antwerp, and 300 tons blende to Bristol.

Antimony.—The market is unchanged at 10½@11½c., depending upon brands and deliveries.

Nickel.—The large producers quote nickel at 40@47c. per lb., for lots of one ton or over, according to size and conditions of order. For small quantities as high as 60c. is named.

Platinum.—Quotations are firm at $20.50 per oz. Gas-engine sparking points vary from 87c. each for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, $1 per gram.

Quicksilver.—Quicksilver is unchanged, $38@$39 per flask—75 lb.—being asked for large orders. For small quantities, $40 is paid. San Francisco prices are easier at $37@$38 for domestic orders, and $36 for

export. The London price is easy at £7 7s. 6d. per flask, from both first hands and jobbers.

Manganese Alloys.—Prices for manganese alloys in Germany are given by Herr Paul Speier as below. The prices are for orders of not less than 500 kg., delivered in Bremen, and are as follows, per 100 kg.: Manganese copper, No. 1, guaranteed 30% manganese, 265 marks; No. 2, 28 to 30% manganese, for bronze, etc., 175 marks; No. 3, 25 to 20% manganese with 2 to 4% iron, 165 marks. Manganese tin, No. 1, free of iron and guaranteed 55% manganese, 365 marks; No. 2, 55% manganese, with some iron, 225 marks. Manganese nickel, No. 1, free of iron, 450 marks; No. 2, carrying some iron, 270 marks.

Manganese metal is quoted at 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen.

Cadmium.—Metallic cadmium, guaranteed 99.5%, in lots of 100 kg. or over, brings 7.10 marks per kg., net cash, f.o.b. Hamburg, in shipping packages. This is equal to 76.65c. per pound.

Thallium.—Thallium is quoted at 60@65 marks per kg.—equal to 64.8@70c. per lb.—at Breslau, Germany.

Minor Metals.—For minor metals and their alloys, wholesale prices are f. o. b. works:

	Per lb.
Aluminum.	
No. 1, 99% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesium, pure (N. Y.)	$1.60
Manganese (98@99% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$2.75
Tantalic acid (N. Y.)	50c.
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Variations in prices depend chiefly upon the size and conditions of orders.

Missouri Ore Market.

JOPLIN, June 17.

The highest price reported paid for zinc ore was $43.50 per ton, and the assay basis was quoted at $39@$42 per ton of 60% zinc, medium grade ores receiving relatively a better price than the highest grades. With a firmer spelter market and a refusal of all the smelters to entertain a proposition to name a price for the exportation of 3,000 to 5,000 tons of metal, zinc-ore producers are looking forward to successive advances in ore prices from now on. The output is light; it has been so since the wet weather set in, about the middle of May, and will not be materially increased until the latter part of July or the early part of August, as there is a strong probability that many miners will take a week or two off for the Fourth of July. Excessive heat at this season is also against an increase in the output. Mine operators are satisfied with existing conditions and the probabilities of better prices without any organized effort to restrict the output, but the employees are asking for a lay-off. In reference to the foreign demand for spelter, the local agent for Beer, Sondheimer & Co. was instructed to secure prices, with the result above stated. This is known to the producers and is causing them to expect better metal quotations. They have no desire to ask more for their ore than it is relatively worth in spelter, so long as prices are maintained about a $40 to $45 basis, but if spelter is scarce, as the refusal to quote prices for export would indicate, there remains no reason why prices should not be maintained on a higher plane than at present. Lead prices are unchanged. Following are the shipments for the week:

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City	1,917,190	510,430	$63.730
Joplin	2,711.430	228,810	63,575
Duenweg	817,190	57,870	22.110
Galena-Empire	676,840	145,940	18,150
Aurora	896,580	.....	15,230
Alba	531.460	27,850	11,970
Neck City	478,420	.....	10 280
Badger	436,930	4 990	9,310
Prosperity	272,010	98 290	7,470
Granby	445,000	40,000	6 560
Oronogo	313,960	15,700	6,410
Carthage	222,040	.....	4.660
Baxter Springs	191,550	97 140	3,440
Central City	44,970	.....	990
Beef Branch	93,910	1,020	775
Spurgeon	24,810	4 510	320
Totals	10,004 290	1,232,550	$244,980
24 weeks	229,484,710	27,683,680	$5,929,325

Zinc value, the week, $210,150; 24 weeks, $5,139.675.
Lead value, the week, 35,830; 24 weeks, 790,650.

Monthly Average Prices of Metals.

COPPER IN NEW YORK.

Month.	Electrolytic.		Lake.	
	1904.	1905.	1904.	1905.
January	12.410	15.008	12.553	15.128
February	12.063	15.011	12.245	15.136
March	12.299	15.125	12.551	15.250
April	12.923	14.920	13.120	15.045
May	12.758	14.627	13.000	14.820
June	12.269	.....	12.399	.....
July	12.380	.....	12.505	.....
August	12.343	.....	12.468	.....
September	12.495	.....	12.620	.....
October	12.993	.....	13.118	.....
November	14.284	.....	14.456	.....
December	14.661	.....	14.849	.....
Year	12.823	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	57.500	68.262	July	57.256	.....
Feb	56.500	67.963	August	56.952	.....
March	57.321	68.174	Sept	57.645	.....
April	58.247	67.017	Oct	60.012	.....
May	57.321	64.875	Nov	65.085	.....
June	56.398	.....	Dec	66.384	.....
			Av., year.	58.587	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	28.845	29.325	July	26.573	.....
Feb	28.087	29.262	August	27.012	.....
Mar	28.317	29.523	Sept	27.780	.....
April	28.132	30.525	Oct	28.596	.....
May	27.718	30.049	Nov	29.185	.....
June	26.325	.....	Dec	29.286	.....
			Av., year.	27.986	.....

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	4.347	4.552	July	4.192	.....
Feb	4.375	4.450	Aug	4.111	.....
Mar	4.475	4.470	Sept	4.200	.....
April	4.475	4.500	Oct	4.200	.....
May	4.423	4.500	Nov	4.200	.....
June	4.496	.....	Dec	4.600	.....
			Av., year.	4.309	.....

SPELTER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	4.863	6.190	4.673	6.032
February	4.916	6.139	4.717	5.989
March	5.057	6.067	4.841	5.917
April	5.219	5.817	5.038	5.667
May	5.031	5.434	4.853	5.284
June	4.760	.....	4.596	.....
July	4.873	.....	4.723	.....
August	4.866	.....	4.716	.....
September	5.046	.....	4.896	.....
October	5.181	.....	5.033	.....
November	5.513	.....	5.363	.....
December	5.872	.....	5.720	.....
Year	5.100	.....	4.931	.....

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.005	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	56.600	24.974	26.108
May	55.430	57.832	25.578	26.664
June	55.673	.....	25.644	.....
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

Dividends.

Company.	Payable.	Rate.	Amount.
‡American Cement	July 20	.30	60,000
Alaska Mexican	June 6	$0.75	$135,000
Alaska Treadwell	June 6	6.30	1,320,000
Alaska United	June 6	.50	90,100
†Calumet & Hecla	June 23	10.00	1,000,000
†Central C. & C., pfd	July 15	1.25	23,437
†Central C. & C., com	July 15	1.50	76 875
†Copper Range	July 1	1.00	383,781
†Daly West	June 15	.60	108,000
El Paso		.03	75,000
‡Empire Steel & Iron, pfd	July 1	1.50	248,850
General Chemical	July 1	1.50	150,000
§Greene Copper	June 20	.40	345 600
†Guggenheim Explorat'n Co.	July 1	1.75	183,750
*Homestake	June 26	.50	109,200
Iron Silver	July 1	.10	50,000
‡Maryland Coal	June 30	2.50	47,125
Maryland Coal	June 30	1 ex.	18,850
†Sloss-Sheffield	July 1	1.75	117,250
‡Tennessee C., I. & R., pfd	July 1	3.00	8,520
Uncle Sam	June 24	.01	5,000
‡Utah Consolidated	July 15	2.00	600,000
†Virginia-Carolina	July 15	2.00	360,000

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Apollo, Alaska	July 8	.....	.20
Caledonia Silver	July 7	July 28	.10
Centennial Copper, Mich	Aug. 10	.....	2.00
Exchequer, Nev	July 7	July 28	.05
Mexican Gold & Silver, Nev	June 5	July 10	.15
Middle Yuba, Nev	July 7	.....	.01
Mohican, Cal	July 10	.....	.10
New Almaden, Mex	July 20	.....	.00½
Yellow Jacket	June 27	Aug. 1	.10

STOCK QUOTATIONS.

NEW YORK

Name of Company.	Week, June 20. High.	Week, June 20. Low.	Closing. High.	Closing. Low.	Sales.
Alice					
Amalgamated			80⅝	79⅝	55,100
Anaconda	26	25⅜	26	25 13/16	4,600
Con. California & Virginia	1 50	1.40			800
Elkton Consolidated	46	45			800
Federal Min. & Smelt	1.00				100
Federal Preferred	93	29	92¼	92	400
Greene Copper	23⅛	21⅛	22⅛	21⅜	54,900
Greene Gold	4⅛	2⅝	4⅛	3⅞	98,425
Homestake	78½				100
Horn Silver					
Iron Silver	3.50				100
Isabella					
Little Chief					
Ontario					
Ophir					
Portland					
Quicksilver	1.00				750
Quicksilver Preferred					
Standard					
Tennessee Copper	25½				100
United Copper	25	23	24⅛	23⅝	12.800

Total sales, 228,975.

BOSTON

Name of Company.	Par Val.	Week, June 20. High.	Week, June 20. Low.	Closing. High.	Closing. Low.	Sales.
Allouez	$25	23	22	23	22¾	2,243
Amalgamated	100	80¾	79	80⅜	79¾	5,066
Atlantic	25	13½	12½	12⅞	12¾	415
Bingham Consolidated	50	29	28¾	28¾	28½	1,505
Bonanza Development	10	55	50	55		850
Boston Consolidated	10	8¼	8			1,250
Calumet & Hecla	25	635	610½	636	630	81
Catalpa	10					
Centennial	25	18	17⅛	18	17⅛	625
Consolidated Mercur	5	50	49	50		2,300
Copper Range Consolidated	100	69½	67¾	69½	69⅛	842
Daly-West	20	12¾	11⅜			209
Elm River	12			2⅞		50
Franklin	25	8½	8			200
Granby	10	5⅞	5¾	5¾		1,280
Greene Consolidated Copper	10	23⅛	21⅜	22¼	21¾	20,124
Guanajuato Consolidated	5	4⅜	4¾			200
Isle Royale Consolidated	25	19¼	18			820
Mass Consolidated	25	7⅞				50
Mayflower	25					
Michigan	25	13¾	12½	13¾	13	1,410
Mohawk	25	49¾	49			225
Old Dominion	25	25¼	24¾	20¾	24¾	450
Osceola	25	92	91	91½		290
Parrot	10	22½	22	22		255
Phoenix Consolidated	25	1¼	1 1/16	1 1/16		460
Quincy	25	97	96½			26
Shannon	10	7⅜	7	7¼	7⅛	833
Tamarack	25	106	106	106		8
Tennessee	25					
United Copper, common	100	24¾	22¾	24¾	24⅜	800
United States	25	29½	28	29	28⅛	4,145
United States Coal & Oil	25	10⅛	10	10⅛		295
Utah Consolidated	5	45	43¾	45	44½	4,900
Wolverine	25	110	108	110		144

Total sales, 52,351 shares.

MEXICO. June 9

Company.	Prices, Mex. Bid.	Prices, Mex. Ask.	Company.	Prices, Mex. Bid.	Prices, Mex. Ask.
DURANGO:			San Rafael y An., aviada	$620	$650
Penoles	$2,600	$2,800	Soledad, aviada	910	950
San Andres de la Sierra			Sorpresa, aviada	240	250
GUANAJUATO:			MEXICO:		
Cinco Senores y An., aviadoras	15	20	Aldebarren	33	40
Cinco, Senores y An., aviada	32	40	Buen Despacho	42	50
Providencia, San Juan de la Luz	145	148	Dos Estrellas	3,500	3,600
GUERRERO:			La Esperanza (El Oro)	1,500	1,500
Garduno y Anexas	25	30	Santa Ana, Esperanza	30	60
HIDALGO:			NUEVO LEON:		
Amistad y Concordia	54	60	La Fraternal	580	620
Carmen aviada	160	174	Norias de Bajan	700	750
Guadalupe Fresnillo Mill	170	200	SAN LUIS POTOSI:		
Guadalupe Fresnillo Mine	70	80	Concepcion y An	20	30
Maravillas y An., aviador	75	100	El Barreno, aviadora	104	107
Maravillas el Lobo	130	180	Sta. Maria de la Paz	254	256
Refugia, aviada	5	7	ZACATECAS:		
Sta. Gertrudis y An., aviadas	8	12	Asturiana y An	8	12
Sta. Gertrudis y An., aviadora	60	61	Candelaria y Pinos	100	105
San Rafael y An., Trompillo	1,770	1,780	San Carlos y Annexas	15	20
			Sta. Maria de Gaud	77	80
			MISCELLANEOUS:		
			Bartolome de Medina	75	80
			Naica (Chihuahua)	11,000	13,000
			Natividad (Oaxaca) aviadora	700	750
			San Francisco Hac	79	84
			Union Hacienda	250	300

LONDON.

Company.	Par Val. £	Par Val. s.	Latest dividend. Amt. s.	Latest dividend. Amt. d.	Latest dividend. Date.	June 8. Buyers. £	Buyers. s.	Buyers. d.	Sellers. £	Sellers. s.	Sellers. d.
American:											
*Alaska Treadwell	5	0	2	0	Apr., 1905	6	13	9	6	16	3
Anaconda	5	0	2	0	May, 1905	5	6	3	5	6	9
Camp Bird	1	0		9	May, 1905	1	13	9	1	15	0
El Oro	1	0		9	July, 1904	1	0	0	1	2	6
Le Roi	5	0	5	0	Nov., 1899		16	3		18	9
Le Roi No. 2	5	0	2	0	Jan., 1905		13	9		16	3
Montana	1	0		6	Apr., 1899			9		1	3
Stratton's Independence	1	0		6	May, 1905		10	3		10	9
Tomboy	1	0	1	0	Dec., 1904	1	0	0	1	2	6
Tyee	1	0	2	0	Dec., 1904	1	5	0	1	7	6
Utah Con	1	0	6	0	Jan., 1905	8	15	0	9	0	0
Ymir	1	0	1	0	Mar., 1902		1	3		3	9
European:											
Linares	3	0	5	0	Apr., 1905	3	15	0	4	5	0
*Mason & Barry	1	0	7	0	May, 1905	2	17	6	3	2	6
Rio Tinto	5	0	37	6	Apr., 1905	61	2	6	61	7	6
Rio Tinto, pf	5	0	2	6	Apr., 1905	6	2	6	6	7	6
*Tharsis	2	0	7	0	May, 1905	6	0	0	6	5	0
West Australian:											
Associated	1	0	2	6	July, 1904	1	17	6	1	18	9
Golden Horseshoe	5	0	6	0	Apr., 1905	7	0	0	7	2	6
Great Boulder		2		9	Apr., 1905	1	3	0	1	3	6
Great Boulder Perseverance	1	0		9	Mar., 1905		12	9		13	3
Great Fingall	1	0	7	6	Apr., 1905	7	5	0	7	7	6
Ivanhoe	5	0	9	0	Apr., 1905	7	16	3	7	18	9
Kalgurli	1	0	2	6	Apr., 1905	7	11	3	7	12	6
Lake View	1	0	1	6	Oct., 1904		18	9	1	1	3
Oroya-Brownhill	1	0	4	0	Mar., 1905	3	6	3	3	8	9
Miscellaneous.											
Broken Hill		8	1	6	May, 1905	1	8	1½	1	9	4½
Mt. Lyell	3	0	1	3	Dec., 1904		18	0		19	0
Mt. Morgan	1	0		3	May, 1905	2	12	6	2	15	0
Waihi	1	0	2	6	Mar., 1905	5	18	9	6	1	3
Indian:											
Champion Reef		10	1	3	Apr., 1905	1	13	9	1	15	0
Mysore		10	5	6	Mar., 1905	7	0	0	7	2	6
Nundydroog		10	1	6	Mar., 1905	1	1110½		1	13	1½
South African:											
Angelo	1	0	5	0	Feb., 1905	6	0	0	6	5	0
British So. Africa	1	0	rts.		May, 1899	2	0	7	2	1	9
City & Suburban	4	0	6	0	Feb., 1905	5	7	6	5	10	0
Consol. Gold-Fields	1	0	2	6	Dec., 1904	7	12	6	7	13	9
*Crown Reef	1	0	20	0	Apr., 1905	12	15	0	13	5	0
De Beers, preferred	2	10	10	0	Feb., 1905	17	16	3	17	18	9
De Beers, deferred	2	10	2	0	Feb., 1905	16	18	9	17	1	3
East Rand	1	0	4	0	Feb., 1905	7	17	6	7	18	9
Ferreira	1	0	2	0	May, 1905	19	10	0	20	10	0
Geldenhuis	1	0	5	0	Feb., 1905	4	8	9	4	11	3
Geduld	1	0	rts.		Mar., 1902	6	18	9	7	1	3
Henry Nourse	1	0	8	0	Feb., 1905	7	7	6	7	12	6
Knights	1	0				4	17	6	5	2	6
Langlaagte	1	0	2	0	Feb., 1905	3	7	6	3	10	0
Modderfontein	1	0	rts.		Apr., 1902	10	1	3	10	3	9
New Kleinfontein	1	0	rts.		Apr., 1902	2	3	9	2	6	3
New Primrose	1	0	3	0	Feb., 1905	2	10	0	2	12	6
Premier, def		2½	10	0	June, 1905	14	15	0	15	0	0
Premier, pf		5	6	3	June, 1905	9	1	3	9	3	9
Rand		5	5	0	Aug., 1904	9	16	3	9	18	9
Randfontein	1	0	rts.		Apr., 1899	2	12	6	2	15	0
Robinson	5	0	8	0	Feb., 1905	9	5	0	9	10	0
Robinson Deep	1	0	3	0	Aug., 1904	5	11	3	5	13	9
Rose Deep	1	0	3	0	Feb., 1905	7	10	0	7	15	0
Simmer & Jack	1	0		6	May, 1905	1	13	9	1	16	3
Village Main Reef	1	0	4	0	Jan., 1905	5	7	6	5	12	6
Wemmer	1	0	12	6	Dec., 1904	6	5	0	6	15	0

* Ex-dividend.

LONDON (*By Cable**).

Company.	June 20 £	June 20 s.	June 20 d.	Company.	June 20 £	June 20 s.	June 20 d.
Camp Bird	1	15	3	Esperanza	1	8	3
Consolidated Gold Fields	6	15	0	Modderfontein	9	18	9
De Beers	16	2	6	Rand Mines	9	12	6
Dolores	1	9	0	Rio Tinto	61	10	0
East Rand	8	18	1½	Simmer & Jack	1	15	0
El Oro	1	1	3	Tomboy	1	0	0

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York.

PARIS.

Company.	Location.	Par value.	Latest dividend.	June 8. Opening.	June 8. Closing.
		Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	2,000	75.00	1,955.00	1,948.00
Anzin, coal	France		290.00	5,845.00	5,826.00
Biache-St. Vaast	France	1,000	160.00	3,605.00	3,605.00
Boleo, copper	Lower Cal.	500	104.17	2,670.00	2,670.00
Bruay, coal	France	400	27.50	785.00	789.00
Courrieres, coal	France	500	110.00	3,125.00	3,125.00
Escombrera-Bleyberg, z.	France	350	35.00	710.00	707.00
Huanchaca, silver	Bolivia	125	2.50	83.50	84.50
Laurium, zinc, lead	Greece	500	25.00	339.00	338.00
Malfidano, zinc	Italy	250	50.00	648.00	640.00
Metaux, Cie. Fran. de	France	500	22.50	555.00	548.00
Mokta-el-Hadid, iron	Algeria	500	40.00	1,049.00	1,070.00
Nickel	N. Caledonia	250	22.50	710.00	712.50
Penarroya, coal	Spain	500	45.00	1,184.00	1,177.00
Vielle Montagne, zinc	Belgium		30.00	825.00	820.00

THE ENGINEERING AND MINING JOURNAL

A Slag Calculation.

BY CHARLES S. PALMER.

The lamented van Furman once told me that, just after he had published the first edition of his book on 'Assaying,' with its chapter on slag calculation, he was the recipient of scores of letters from furnace-men all over the world protesting against his revealing to the public the secrets which should be closely guarded within the free-masonry of the guild. The methods of calculation, as given by van Furman, do not commend themselves as being either remarkably lucid or practical for daily work; though some of them would doubtless have to be used in the discussion of certain unsolved problems, such as the rôle of alumina in slags. From what I know of the practical experience of van Furman, it is clear that he really worked out his own methods of calculation, and that he had a perfect right to use them in any way that he saw fit. But in that refreshingly frank and helpful book, 'Lead and Copper Smelting,' by Hixon, the author justly ridicules the old, confused and cumbrous methods of calculation, and cuts the matter short—so short, in fact, that he is not entirely clear. The following method was given me by one of the best practical furnace-men in the West; and on my inquiry as to the necessity of guarding it as a secret, he replied that the method was in such common use and was so well known that there was no particular need of publishing it. But, as I have never seen it printed in detail, I venture to submit it for the use of young students, and also for those who are still working at the old problems.

The calculation of the copper blast-furnace slag considers:

1. The composition of the half-dozen main ingredients of the charge.

2. The amount of the sulphur, of the charge, that is burned off; this is the basis of the calculation. In the case considered here it is figured that 70% of the sulphur is so burned off. This will vary with the furnace, the ore, the degree of roast, the flux, the pressure of blast, and all special conditions that attend any particular plant.

3. The amount of the sulphur (from the 30% residue) that will be required for the copper present, in making matte.

4. The amount of iron that will be required by the residual sulphur, after the copper has been cared for, in matte-making. This iron is calculated as oxide, and deducted from the total iron oxide present; the remainder is the iron oxide used in the slag, together with the silica and lime.

5. The actual total of the residual iron, the silica and the lime, each of these three respective components being figured to its proper percentage.

6. It will be noticed that this result gives the relative acidity and basicity of the slag in terms of silica, on the one hand, and of iron and lime, on the other hand; but it says little about the composition of the matte; and the furnace-man is left to his skill in reading the signs, or to the assays for certain knowledge. It will be noticed, also, that this is silent regarding the alumina, magnesia and true alkali in the slag; all of these must be calculated—like the silica, iron and lime—from systematic analyses of the original ingredients for these substances—something neglected in ordinary work.

It will well repay every student to follow through, with pencil and paper, every detail of the table of figures given here. It includes:

1. The composition of five ingredients of a typical charge; the old slag is scavenger material, perhaps, from reverberatory and converter, or the roaster; in short, any stuff is included that accumulates and which is rich enough to run through the accommodating blast-furnace. The list of ingredients includes ore, concentrate, briquette, limestone and old slag, the latter being really a mixture of old slag-and-matte chips.

2. It will be noticed that the sulphur of the old slag is not included in the partial total from which 70% is burnt off, because old matte does not usually lose much sulphur in being put through the furnace, the bessemerizing being practically limited to the region of the tuyeres—though authorities may differ on this point.

3. The 29 lb. deducted from the total copper represents the estimate of the average loss, in slag, flue-dust, etc.

TABLE.

	Sulphur %	Sulphur lb.	Copper %	Copper lb.	Iron (FeO) %	Iron (FeO) lb.	Lime %	Lime lb.	Silica %	Silica lb.	Total Weights
Ore	20	280	11	154	26	364	..	....	35	490	1400
Concentrate	28	420	8	120	30	450	..	....	30	450	1500
Briquettes	12	192	6	96	13	208	..	....	58	928	1600
		892									
		.30 (=sulphur factor)									
		267.6 (=residual sulphur not burnt off)									
Limestone							50	1150	5	115	2300
Old slag	5	80	14	224	46	736	..	....	31	496	1600
		347		594		1758		1150		2479	8400
				29 (=5% loss)							
				4) 565							
		141		141 (= sulphur used by copper in matte)							
Sulph. for iron (in matte)		206									
		1.75									
		360.5 (= iron in matte)									
		9/7 (to change Fe to FeO)									
		463+									
Total FeO = 1758											
		463 (= FeO in matte)									
		1295 (= FeO in slag)									
		1150 (= CaO in slag)									
		2479 (= SiO_2 in slag)									
		4924 = total weight of SiO_2, FeO, CaO in slag.									

The rest of the calculation will probably explain itself; it will be clear that the amount of sulphur to be provided for is the central point of the whole calculation, which is probably a fair sample of actual practice.

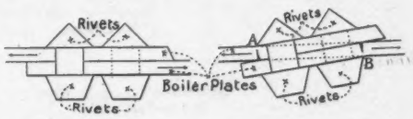
In this practice, these three (silica, ferrous oxide and lime) made up about 87% of the slag. Therefore we have: 87% : 100% :: 4924 : x, which = 5659, which is the true theoretical 100% weight from which to calculate the respective percentage of each of the three hence—

5659 : 2479 :: 100% : x = % SiO_2 in slag, = 43.8
5659 : 1295 :: 100% : y = % FeO in slag, = 22.8
5659 : 1150 :: 100% : z = % CaO in slag, = 20.3
86.9

Note the close checking of these last figures with the theoretical 87% of SiO_2, CaO and FeO, respectively, in the slag.

A Locomotive Boiler Explosion.

A lap-joint seems to have been the defect which occasioned the frightful explosion of a locomotive recently at Brockton, Mass. This form of weakness (according to *The Locomotive*) may occur in either the outer or the inner plate of the boiler, and always starts from "that face of the affected plate which is in contact with the overlapping plate." Hence the crack is secondary to the construction of the boiler, and the crack is liable to lie hidden by the lap of the other plate, or



by a rivet head. The joint itself may be occasioned by an undistributed curvature or bending as the lap-joint passes the tension in a direct line from one plate to the other (as shown in the cut given here-with, and taken from the authority quoted). The danger and its observance are by no means new in the history of accidents, but it emphasizes a fact, the repetition of which is in order as long as the danger persists.

Concentration of Copper Ore—II.

BY FRANK H. PROBERT.

The Morenci and Clifton mills (Graham county, Arizona) are fortunate in the small proportion of copper oxide. Mr. Graybill, the superintendent of the Shannon, informs me that a grab sample, taken from the feed from the belt, showed that more than 40% of the total copper was in the form of oxides.

The fine should be screened out of the ore before going to the crusher. A bumping screen (feeding the rock-breaker) having 1½-in. perforation is found to give good results, the fine going directly to the trommels. The system of sizing in trommels and jigging each size on separate frames is the same as that adopted in all wet-concentrating plants. At the present time, the Arizona Copper Company is testing a new appliance at its No. 3 mill. It is called a 'Kangaroo jig,' and so far it has surpassed all that was expected of it. A rocking motion is imparted to the jig-frame itself. It has a capacity of 35 tons per hour, and will treat material from ⅝-in. ring down. It can therefore be used for the products of the Chilean mills, and if the tests continue to be satisfactory it will revolutionize milling practice in the Clifton district. One machine does the work of seven ordinary jigs, and it takes 5 h. p. to run it, so that it has two attractive features, low consumption of power and great capacity. Clean concentrate is obtained. The contrivance is attracting much attention in the district.

For the re-crushing of the jig tailing, the Huntington mill is used by the Arizona Copper and the Shannon Copper companies, while the Detroit Copper Company claims that the Bryan mill does the best work. The object is to prevent sliming. It was my privilege, some two years ago, to make a comparison of the Bryan mill, Huntington mill and high-speed rolls at the West Yankee and Longfellow concentrators, Morenci, which work resulted in the abandonment of high-speed rolls for fine crushing. There is little to choose between the two types of Chilean mills.

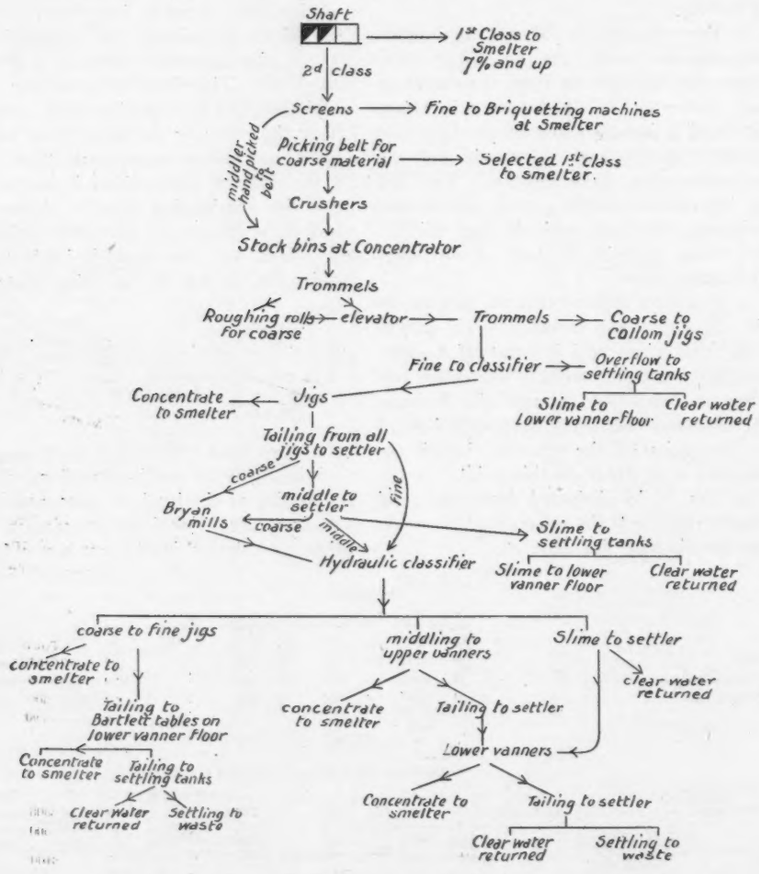


FIG. I. DIAGRAM OF PRACTICE, WEST YANKEE CONCENTRATOR.

The following table is a summary of a series of tests made at Morenci; it is compiled by taking the average of some 30 different samples at different times from the three machines. The samples were dried before screening, no pressure was used in sieving the pulp; and, even admitting that some small part was pulverized in the process, the error would be the same in all; therefore the figures given herewith show the comparative merits of these three types of re-crushing apparatus.

	Bryan Mill.	High-speed Rolls.	Huntington Mill.
Left on 20 mesh	2.89%	0.79%	11.18%
" 40 "	18.28%	17.13%	20.42%
" 60 "	10.65%	10 25%	6.35%
" 80 "	5.93%	4.64%	3.05%
" 90 "	2.49%	1.94%	1.65%
" 100 "	.....	.....	.....
" 120 "	5.04%	5 07%	3.52%
" 160 "	2 23%	1.79%	1.09%
" 200 "	2.77%	3.05%	1.38%
Through 200 "	49.69%	55.31%	50.94%

The screen of the Bryan mill was 1½ mm.; that on the high-speed rolls was 10 mesh, and that on the Huntington mill was 2½ millimeters.

Mr. Wallace, of Morenci, who followed up my experiments by a series of wet-screen analyses on the pulp from the different machines, furnished the following tables:

BRYAN MILL. DETROIT COPPER CO.

Screen on Mill 2½ mm. punched. Oct. 20, 1903.

	Oz.	% Wt.	Assay.	Cu in Sizes	% Cu in sizes
Left on 20	2.625	11.95	0.6	7.17	6.60
" " 30	2.375	10.80	0.67	7.24	6.67
" " 40	1.375	6.25	0.85	5.31	4.92
" " 50	1.250	5.68	0.92	5.23	4.82
" " 60	2.000	9.10	1.00	9.10	8.38
" " 70	0.625	2.84	1.08	3.07	2.83
" " 90	1.250	5.68	1.31	7.45	6.85
" " 120	1.250	5.68	1.65	9.36	8.63
" " 150	0.750	3.41	1.88	6.42	5.92
" " 200	0.500	2.27	2.13	4.83	4.44
Thro. 200	8.000	36.40	1.20	43.60	40.10

Sample assayed 1.04%.

The Huntington mills of the Longfellow concentrator at Arizona Copper Company, Morenci, gave the following results:

Screen on Mill 2½ and 2 mm. Oct. 1903.

	Oz.	% Wt.	Assay	% Cu in Sizes
Left on 20.....	5.125	15.30	0.95	11.30
" " 30.....	4.000	11.95	0.99	9.22
" " 40.....	2.000	5.95	1.09	5.08
" " 50.....	1.625	4.85	1.25	4.76
" " 60.....	2.000	5.97	1.54	7.18
" " 70.....	0.875	2.61	1.72	3.51
" " 90.....	1.000	2.99	1.94	4.53
" " 120.....	1.375	4.11	2.35	7.58
" " 150.....	0.875	2.61	2.92	5.94
" " 200.....	0.625	1.87	2.89	4.22
Thro. 200.....	14.000	41.80	1.13	36.70

Screened pulp from the Huntington mills of the Shannon concentrator was sent to Morenci for analysis, and the following results obtained:

Screen 1mm. punched (old).

	Grams.	%	Assay.	Cu in sizes.	% Cu in Sizes.
Left on 20	8,100	1.83	0.55	1.01	0.645
" " 30	42.986	9.62	0.8	7.70	4.920
" " 40	39.816	8.98	1.00	8.98	5.730
" " 50	31.568	7.12	1.25	8.90	5.670
" " 60	45.316	10.22	1.50	15.30	9.750
" " 70	12.170	2 97	1.75	5.20	3.310
" " 90	22.383	5.05	2.10	10.60	6.760
" " 120	23.333	5 26	2.75	14.45	9.220
" " 150	11.800	2.67	3.45	9.20	5.870
" " 200	9.700	2.19	3.45	7.56	4.810
Through 200	194.830	44.00	1.55	68.20	43.400

Assay sample of 1.60%

Analysis.—SiO_2 66.50%
CaO 0.20%
Fe 3.50%
MgO 1.44%
Al_2O_3 16.70%
S 2.16%
Cu 1.60%

Some of the results that I obtained from wet screening of the Huntington-mill product at the Shannon are given herewith:

Screen 1 mm. punched plate. Half-hourly samples, Jan. 19th.

	Grams.	%	% Cu.
Left on 20	10.106	2.55	0.74
" " 30	43.114	10.89	0.92
" " 40	30.412	7.74	1.07
" " 60	55.813	14.10	1.51
" " 80	6.113	1.54	1.86
" " 100	19.04	4.81	2.04
" " 120	23.787	6.02	2.67
" " 150	10.062	2.54	2.12
" " 200	10.105	2.55	3.22
Thro. 200	187.04	47.33	1.68
Totals	395.593	100.07	

Screen 1½ mm. slotted wire-cloth. Half-hourly samples for 6 hours. Jan. 26th.

	Grams.	%	% Cu.
Left on 20	48.780	15.08	0.78
" " 30	52.365	16.19	0.98
" " 40	26.680	8.25	1.12
" " 60	39.735	12.29	1.44
" " 80	4.440	1.37	1 85
" " 100	12.595	3.89	1.88
" " 120	11.735	3.63	2.48
" " 150	5.715	1.76	3.06
" " 200	5.960	1.84	2.85
Thro. 200	115.300	35.66	1.29
Totals	323.305	99.96	

Slotted wire-cloth is of little use on a re-grinding mill. After a few hours the wires become worn and a coarse product is obtained. An examination of the pulp left on a 20-mesh screen of the last test showed particles measuring from 2½ to 3 millimeters diameter. A heavy punched-plate screen is the best. The heavier the screen the longer its life, and the more even the size of the product. A fine screen produces too much slime and it is only by a series of tests, such as has already been described, that the most suitable size of screen can be determined. A difference of 12% of the total sample is noticed in the impalpable slime passing through a 200-mesh between a machine using 1-mm. screen and another using 1½ millimeters.

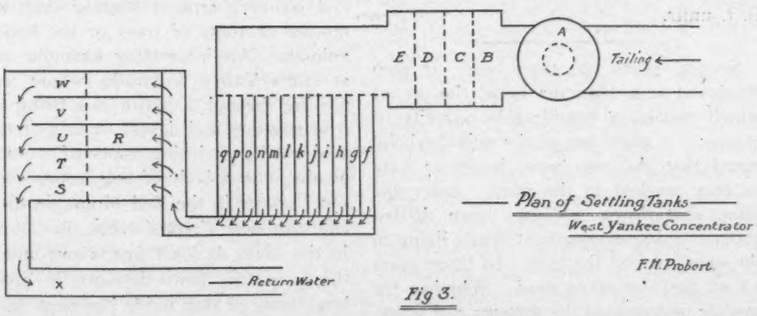


Fig 3.

The marked difference between the assay value of the pulp left on a 200-mesh screen and that of the powder passing through is particularly interesting. I am at present undecided as to the cause of this pronounced falling off in the value, but it may be accounted for by the difference in the hardness of the oxides, silicates and sulphides. It will also be noticed that there is a very decided increase in the amount of slime *passing through* a 200-mesh screen over that left on a 200-mesh, which may be explained by the theory that as soon as the rollers touch the rock it is immediately pulverized. There is no slow grinding action; the harder principles remain coarse, and the balance is reduced to an impalpable powder immediately. This interesting point also shows that such machines clear themselves very rapidly, otherwise one would expect to find a gradual increase in the percentage left on the respective screens. After the 60-mesh size has been reached, there is only about 12% of the total found on the screens up to 200 mesh.

Having re-crushed the material, close classification of the various sizes is necessary to insure clean concentration. The pulp issuing from the mill is run into a long modified spitzkasten, having a number of compartments from which the several sized products are drawn off and conveyed, to one or another of the machines, by launders. Too much attention cannot be paid to this important point. No machine can handle satisfactorily a pulp containing particles varying from 20 to 200 mesh. Close classification in size is the keynote of successful concentration; and the classifiers should be made large enough to handle all the products of the mill, whether using a 2½- or a 1-mm. screen. Ample provision should be made so that, in the event of an increased output from the mill, an equally clean and close classification may be obtained.

At the West Yankee concentrator, the coarser products from the classifier are taken to fine jigs on one side of the mill, and to Bartlett tables on the other side. The fine jigs do excellent work. A screen analysis, given herewith, of the Bartlett tailing shows how efficient these classifiers are, over 71% of the whole being coarser than 40 mesh.

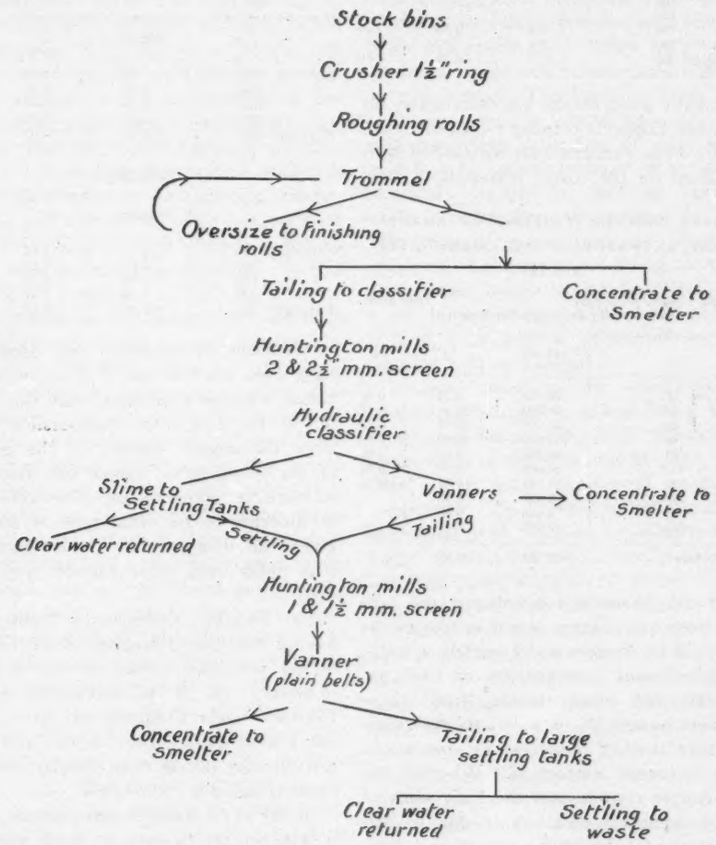


Fig. 2.

DIAGRAM OF PRACTICE, LONGFELLOW CONCENTRATOR.

UPPER BARTLETT TAILING.

	Grams.	%	% Cu.
Left on 10 mesh..	Trace		
" " 20 " ..	64.6	18.94	.82
" " 40 " ..	179.2	52.56	.91
" " 60 " ..	23.4	6.86	.69
" " 80 " ..	6.3	1.84	.86
" " 100 " ..	.....	.....	....
" " 120 " ..	.....	.....	....
" " 150 " ..	9.4	2.75	1.20
" " 200 " ..	1.1	.32	....
Through 200 " ..	55.5	16.39	1.60

Equally good results are obtained at the Arizona Copper Company's concentrators, where Frue vanners with corrugated belts are used for the coarse materials.

COARSE VANNER TAILING OF SHANNON CONCENTRATOR, USING CORRUGATED BELTS.

Screen 1 mm. punched. Jan. 10th.
Half-hourly samples for 6 hours,

	Grams.	%	Cu.
Left on 20.....	14.058	4.11	0.66
" " 30.....	76.664	22.41	0.72
" " 40.....	57.202	16.71	0.89
" " 60.....	115,959	33.89	0.99
" " 80.....	12.860	3.76	0.95
" " 100.....	19.602	5.73	0.94
" " 120.....	13.934	4.07	0.70
" " 150	3.733	1.10	....
" " 200.....	3.160	0.93	....
Thro. 20	24.920	7.20	1.38
Totals	342.132	99.99	

At the Shannon concentrator the tailing from the vanners is not re-treated, as in the West Yankee and Longfellow mills. A microscopic examination of the concentrate and coarse tailing from these vanners would be of value to determine whether further reduction in size would give increased extraction. Whether the low-copper content and the high silica of the concentrate obtained is due to different-sized particles of quartz and mineral being washed over together, or to a large proportion of middling, is a question not easy to answer without a microscopic examination. If the latter explanation is correct, then finer crushing should be resorted to; if the former, then more vanners, and less feed to each, is the solution of the difficulty.

Corrugated belts are far superior to plain rubber belts for the concentration of coarse material.

	Slime Vanners.	Shannon Concentrator.	
	Grams.	%	% Cu.
Left on 20...	.....	.....	....
" " 30...	.....	.....	....
" " 40...	.....	.....	....
" " 60...	.....	.....	....
" " 80...	.....	.....	....
" " 100...	.....	.....	....
" " 120...	.....	.....	....
" " 150...	0.64	0.45	....
" " 200...	1 84	1.30	....
Through 200...	138.51	98.24	1.18
Totals.	140.99	99.99	

The tailing from the Bartlett tables and the fine jigs at the West Yankee mill, together with the tailing from the vanners treating the intermediate-sized products, and the slime from the hydraulic classifier below the re-crushing mills, are all re-treated on a series of vanners on the lower vanner floor, where a last effort is made to extract the values. During the month of June, 1901, the average extraction obtained on the slime vanners amounted to 64.0%. Screen analyses of the feed and tailing from these vanners showed:

FEED.

	Grams.	%	% Cu.
Left on 80	1.65	1.19	....
" " 100.....	1.30	0.22	....
" " 160	5.50	3.93	0.98
" " 200.....	2.10	1.52	....
Through 200.....	128.40	93.07	1.10

TAILING.

	Grams.	%	% Cu.
Left on 80.....	2.10	1 67	....
" " 100.....	0 80	0.63	....
" " 150.....	7.70	6.12	0.40
" " 200.....	1.10	0.87	....
Through 200.....	114.00	90.69	1.00

All kinds of schemes and appliances have been tried to see if it is possible to obtain a higher extraction from this slime, but so far it is next to impossible to reduce the copper content of the general tailing below 0.7%. About two years ago an elaborate series of tests was carried out at Morenci to see what type of machine gives the best results. It is significant that today only Frue vanners are being used.

The Shannon Company is fortunate in having the San Francisco river running by the reduction works, so that it is not necessary for it to economize as the Detroit Copper Company has to do. For this reason there is no elaborate system of settlers; the tailing runs directly from the vanners into the river below.

At the West Yankee concentrator, where it is necessary to save as much water as possible and return it to the mill, the tailing is made to pass through a number of tanks, and as much solid matter as will is allowed to settle.

The gas plant at Truro, Cornwall, England, furnishes a water gas made from tar, and costing 8.92d. (about 20c.) per 1,000 cu. ft. It is furnished with benzol enrichment for illumination, but the bare gas has a calorific value of 350 to 400 B. t. units.

Several years ago there were 27 men employed in a Montana mine, the ore of which carried a considerable quantity of arsenic. A physician of the neighborhood noted that the men were hardy as long as they worked in the mine. Later the mine shut down, and the men drifted about to other employment, many living in the open and on the hills. In three years all of the men were dead. Whether the arsenic undermined the systems and weakened them in a chronic way or not, the fact is worth considering, that a frightful mortality rate prevails among men who work under conditions where there is opportunity for the absorption of arsenic by the body.

Organic Remains in Ore Deposits.

BY ARTHUR LAKES.

The presence of organic matter, both animal and vegetable, in some ore deposits, as well as the affinity of mineral solutions for organic substances and their tendency to precipitate upon them, has often been observed.

Sulphate of copper in mine water readily precipitates upon a piece of wood or bone. Handles of picks left in a wet copper mine have been found saturated with copper salts, and in part replaced by metallic copper. In deposits of copper-bearing shale or sandstone in the Permo-Carboniferous of South Park, Colorado, I have found fossil leaves coated or replaced by green carbonate of copper, the color simulating in a vivid way the original tint of the foliage. Organic remains changed into copper abound in the Permian of the Ural mountains. In New Mexico precipitation and substitution of copper minerals for beds of fossil wood and vegetation have taken place, in one case to such an extent that the deposit was mined for copper. Specimens sent to me for examination showed that the center, or pith core, of the branch or tree-trunk was replaced by chalcocite, with rings around it of malachite and azurite. In the copper mines at Frankenberg, in Hesse, the ore assumes the form of fossil plants, the stalks, fruit and leaves being often converted into tetrahedrite; in others, into coal traversed by strings of copper ore.

In the copper mines of Atacama, Chile, the body of an Indian miner was found a short time ago who had been killed by a fall of the roof while collecting the mineral atacamite in a small basket, which was still in his hand with his stone implements alongside. The body was in a perfect state of preservation, due to impregnation of the tissues by copper salts, as well as to the antiseptic action of the dry climate. The body was probably three hundred years old.

Iron ore is frequently fossiliferous. Its origin as bog iron accounts for this. Iron brought in solution, from a vein of iron pyrite, into a pond or marsh, precipitates and oxidizes around floating drift-wood, mosses or roots of trees or the bones of animals. An interesting example occurs at Halls Valley, Colorado, where waters passing through a pyrite vein bring down iron sulphate and deposit it in a marsh as iron oxide, enclosing roots of trees, and passing into a body of bog iron ore. The same occurs in the Red Mountain district, and also near Crested Butte, in Colorado. In the Mesa de los Pinos, above and near the great Rio Tinto deposits, in Spain, a large body of iron oxide has been deposited, derived at an early period from elements washed down from the pyrite lode. In this deposit are found leaves of oak and other trees, such as at present grow in the vicinity. In the 'black band' iron-ore deposits of Staffordshire, England, organic

remains in the form of coal are so abundant that the iron is smelted with them.

Bones of animals and remains of trees and fossil vegetation are often found associated with stream tin, and sometimes more or less replaced by tin oxide in old stream-tin workings. Along the coast of Cornwall and on the shores of Guernsey in the Channel islands, at a phenomenally low tide, I have seen the remains of buried peat deposits containing branches of trees, acorns, etc. These buried forests indicate a general subsidence of the land and the existence at a former period of a more extended coast line. Over this buried land in Cornwall once flowed rivers carrying stream tin from the higher land. The Happy Union tin stream-work was situated near the debouchment of the St. Austell valley at the port of Pentewan. The drainage to the stream occupying the valley collected material from the high ground in the vicinity of the ancient tin mines of Polgooth. The deposit is made up of river sand, sea sand and silt, followed below by a bed of fossil vegetation, leaves, acorns, nuts, etc., beneath which lies three to ten feet of 'tin ground,' resting on a bedrock of clay-slate. In the sea sand, estuarine strata 20 ft. thick, were found trunks of oaks and the bones of the great Irish elk and an extinct ox, together with the bones of a whale and two human skulls. At Huel Virgin 'tin ground' were found two pieces of oak artificially pierced with holes, and at Pentewan and Carnon stream-works antlers of deer, containing a considerable amount of tin oxide pseudomorphous after the organic tissues. The original structure was almost entirely replaced and reproduced by cassiterite.

In the Silver Reef sandstone, in Utah, fossil plants occur and seem to have been the medium for precipitation of the silver ore. Fossils are frequently coated or replaced by ore. I have seen a fine example of replacement by native silver, from New Mexico. It consisted of a perfect trilobite, which was entirely replaced by native silver and worn by the owner as a scarf pin. Fossil shells are often beautifully replaced by iron pyrite. Ammonites so replaced look like wheels of burnished bronze.

Animal and vegetable remains are common in gold placers, sometimes silicified, sometimes carbonized, with, at times, gold precipitated on them. These remains are found in the lava-covered placers (deep leads) of California. Silicification was produced by waters percolating through the lava to the gravels and charged with alkali and silica from the lava. As both fossil wood and the conglomerate are firmly cemented with silica, and contain gold, if we were to change the position of these silicified horizontal beds to a steep pitch, or to verticality, we should have a near resemblance to some well-known brecciated gold-bearing fissure veins. Sterry Hunt considered the solution and re-precipitation of gold as still going on in gold placers. He cites an instance of a mass of gold-bearing pyrite from the placers of Ballarat, Australia, that perfectly retained the structure of a tree stem. The gold was probably carried in a soluble form into the pores of the wood and there precipitated with pyrite. In making experiments with gold chloride, a chip of wood and a piece of leather were thrown into the solution and the gold became precipitated on them; it was disseminated in fine particles through these organic substances, which, when cut, showed brightly the metallic luster, proving that organic matter is a chemical agent in decomposing a solution of gold chloride in order to precipitate that metal around some nucleus presented to it, such as fragments of wood common in alluvial deposits.

In Australia, the leaves and wood of eucalyptus are found in good preservation just above the drift under the lava. Gold occurs in the coal measures of New Zealand associated with fossil plants and fossil fruit, and a particle of gold was found in a coal seam, doubtless set free by the decomposition of iron pyrite common to both coal seams and gold-bearing rocks. In the Royal Standard claim on Kauraka hill, at a depth of 30 ft., Kauri gum, pieces of wood, and an old Maori paddle were dug up in the gold-bearing drift. Carbonaceous black schist encloses many Victoria gold veins, suggesting that the segregation and precipitation of gold in the drift may be due to the organic matter of the schist. In the gold-bearing drift of Ballarat, gravel overlain by lava, trees occur with their roots imbedded in the ancient soil and their upper portion enveloped in lava. Copper ores occur in Texas in the form of trees, the ore containing both gold and silver; and in some other Western States fossil trees are found transformed into iron ore carrying gold. In the gold-placers of the Ural, remains of the mammoth auroch and rhinoceros are found deep down in the gold gravels.

The occurrence of charcoal has been noted in some ore deposits of a volcanic or fumarolic origin. In the depths of the Bassick mine at Querida, Colo., great quantities and large pieces of charcoal occur in the throat of an ancient andesite volcano. Charcoal also occurs in some of the fumarole and other ore deposits of Cripple Creek. At the Doctor, Jackpot, Portland, El Paso and Elkton the charcoal occurs both in the veins and in the adjacent breccia. Ore is not precipitated on the charcoal, nor does it contain gold.

We can readily understand how trees growing close to, or even within, the walls of an old crater would be overwhelmed by a subsequent eruption and mingled with the general agglomerate filling the crater throat; this might also occur in the vicinity of a geyser or a fumarole, and in the volcanic breccia whose outpouring overwhelmed the growing trees. In the Yellowstone Park trees in the vicinity of the geysers are in some cases now being silicified, and whole forests of silicified stumps and trunks of trees in that region show that the silicifying process was carried out on a large scale in Tertiary time. At Waihi, in New Zealand, according to Mr. James Park, there are huge veins of chalcedonic quartz, evidently of hot-spring origin, as shown by remains of tree-ferns found in a cavity 350 ft. below the surface, standing in a vertical position and replaced by iron pyrite. The logs are from 2 to 12 ft. long, and 1 to 3 in. in diameter. The reef containing them was of solid white gold-bearing quartz, without any sign of secondary fracture or fissuring, such as could have admitted the remains into the vein after it was formed and filled. A fragment of the wood, according to André P. Griffiths, assays 3 dwt. 6 gr. gold and 1 oz. 13 dwt. 6 gr. silver, or a proportion of 1 oz. gold to 11 oz. silver. The country rock is andesite.

Posepny mentions the occurrence of tree-stems changed to galena in the Vesuvian mine, Bavaria, the lead retaining the exact form of the fiber and annular rings. Timbers in old water-logged mines are sometimes found thoroughly saturated with, and even replaced by, metallic mineral. A remarkable example of the delicate and penetrating power of hot silicifying steam or vapor in the depths of an old mine was shown by a specimen from one of the abandoned levels of the Comstock. A piece of that soft, impalpable white fungus which forms and adheres to mine timbers in old, abandoned workings was entirely replaced by opaline silica, showing all the delicate structure of the fungus.

A remarkable and almost unaccountable occurrence of organic remains was brought to my notice from the depths of the Fisk mine, a gold-bearing fissure vein at Central City, Colo. There a fragment of a tree about 2 ft. long by 4 in. thick was found imbedded in quartz and pyrite at a depth of 1,000 ft. It occurred at a slight enlargement of the fissure, lying horizontally across the vein of quartz, entirely surrounded by, and imbedded in, an unusually large and rich body of gold-bearing iron pyrite. The Fisk vein is an ordinary fissure vein 4 to 6 ft. wide in granite-gneiss and nearly vertical. It appears likely that the fissure for a long time lay open to the surface, so as to allow a tree-trunk to be washed down into it, and after being covered up by quartz and auriferous sulphides, it was gradually changed to coal. As regards the precipitation of minerals by organic substances, T. A. Rickard suggests that the ores of Newman hill in the Rico district, Colo., may have been deposited by the organic substances retained by the carbonaceous shales through which the veins pass. To what extent organic agency may have been at work in the forming and filling of many of our mineral veins and ore deposits is a matter for interesting speculation and research.

The Origin and Classification of Placers—III.

BY H. L. SMYTH.

The moving material is finally delivered to the streams. Physiographers recognize and name three important stages in the reduction of an elevated land to approximate base-level, namely, topographical youth, maturity and old age. Most frequently in the youth of a land surface considerably elevated, the streams flow swiftly and cut into their beds, while their valleys are narrow and steep-sided. The period is one of relatively steep slopes, both in valley-bottom and valley-wall. In maturity these slopes become more gentle, and the valley is widened. The down-cutting of the stream becomes greatly retarded, and in its lower reaches may cease altogether. Finally, in old age the land is worn down to a gently undulating surface, with little difference of elevation between divide and drainage channel. The streams not only cease to corrade, but frequently build up their beds, and hence their direct erosional work is confined to broadening their valleys by wide meanders over their flood plains.

As regards the stripping of the surface, it may be said that in youth denudation is generally active, and the removal of fresh rock, through abrasion or sapping, is relatively important. In maturity and old age the decomposed mantle tends to accumulate, and the streams are fed mainly with the solid products that have reached approximate chemical stability. Indeed, in the latter period the land loses mainly through solution, since only the finer particles are mechanically movable over the gentle slopes then existing.

These three stages are not reached simultaneously over a region undergoing denudation. Old age is attained first by that portion of the land nearest base level, and then successively by those portions farther away. Topographical old age creeps up from the extremity toward the head. Along a single stream, then, these three stages, with the intermediate steps, may sometimes be seen imperceptibly merging into one another.

The transporting power of a stream depends on its velocity, depth and volume. A given volume of water, flowing with a given velocity, can move rock fragments below a given size and weight in given quantity. Larger or heavier fragments are not displaced. Therefore, such a stream effects a rough classification of the materials in its bed, either on the basis of size, if all fragments are of approximately the same density, or on the basis of combined size and weight, if the densities differ markedly. Therefore, one measure of the transporting power of a stream is the maximum size of the boulders which it can move.

Another measure is the total quantity of detritus that it can move in a unit of time. The maximum quantity that can be transported by a stream of given volume and velocity is its maximum load. If a fully loaded stream becomes overburdened (for example, by a reduction of velocity, or by a positive addition of detritus from lateral feeders), part of its burden is dropped. Most frequently the velocity of a stream is diminished by a reduction in its gradient. Therefore, many streams in their lower reaches tend to become overloaded through reduction of velocity, and drop part of their burden.

The effect of positive additions to the load of a stream can be seen nowhere more clearly than in those rivers of the western slope of the Sierras, into which the débris from the great hydraulic mines has been washed. Formerly these rivers, running on high gradients, were cutting actively, as their steep-sided cañons testify. Now, however, their channels are filled up and choked, and they are reduced to mere threads of water, wandering over

LOOKING SOUTH UP BONANZA CREEK, SHOWING WHITE CHANNEL.

the surface or lost in the interstices of the vast mass of material which they are powerless to move.

Let us follow a stream, which shows these stages of development, down from its head, and see what becomes of the solid material that it carries along in the different portions of its course.

On its headwaters such a stream moves with high velocity on a relatively steep gradient and cuts into its bed. The cutting is effected by the sand, gravel and boulders which it moves along, and is not uniform throughout the year. Where, as in most regions, there is seasonal irregularity in the rainfall or water supply, the down-cutting is mainly or wholly effected during the flood season. The visible and infallible index of a down-cutting or corrading stream is steepness of the walls and narrowness of the bottom of its valley. Also, with high gradient, goes great transporting power, and hence comparatively thin deposits in the trench.

The sand, gravel and boulders in the bed of a corrading stream are moved bodily, either constantly or seasonally, or, it may be, at intervals of years and in time of exceptionally high water. During this movement the smaller particles are suspended in the water, while the larger and heavier roll or slide over the bedrock. This movement of the whole contents of a stream-bed, or of all except the larger boulders, is of cardinal importance in effecting the characteristic concentration of the typical stream placer.

Among the rock fragments are some heavy metallic particles, perhaps of gold; and, during the period of movement, these settle, on account of their superior density, to the bottom. If the bedrock is uneven and fissured, they may be arrested in the retarded or back currents, necessarily produced by an irregular bottom, and on account of their small size they may be stopped and protected from wear by working into the crevices. If the stream is unable to move its larger boulders, these play the same part as an uneven bedrock. So the bottom layers of stream gravels and the fissured portions of the bedrock itself are enriched in the heavy metallic particles. The condition that makes this bottom concentration possible is that which makes the corrasion of the stream bed possible, namely, a sufficient volume of water moving with sufficient velocity to flush out its bed. It may be that the bed is scoured only at intervals of years, but without such scour, and a general agitation of the stream gravel, concentration of gold on the bottom would not be possible.

Posepny has attempted to explain the very common bottom enrichment of gold-bearing gravels on the supposition that, while the gravel is at rest, the fine particles of gold, originally distributed through its thickness, gradually, with the help of water, settle through its interspaces, and thus accumulate on the bedrock. This tendency is undoubtedly real, but it can account for only a small part of the bottom concentration actually found in the gravels of actively cutting streams. If the bottom enrichment were mainly due to the after settling of the heavy particles during rest, the enriched layer should contain mainly fine gold, since this would certainly work more readily than coarse through the interstices of the gravel. But in fact such deposits always have their coarser gold on the bottom, and their finer gold higher up. It is generally observed that, in actively cutting streams, the size as well as the quantity of the gold particles rapidly diminishes with distance above the bedrock, a relation the reverse of that which would be brought about by after settling.

The general physiographic condition which gives rise to a corrading stream is that to which the other characteristics of a young topography are due, namely, recent elevation or tilting. Topographic youth is generally a period of rapid denudation, and for that reason unfavorable to the accumulation of a mantle of decay

enriched in selected heavy and obdurate particles. In so far, therefore, as the gravel of corrading streams is composed of fragments broken from relatively undecayed rock, it is not apt to be rich in gold or other valuable heavy particles. It may happen, however, that the elevation, which in a new cycle develops youthful features in the topography, has followed a period of maturity, during which slow denudation had permitted the accumulation of selected heavy particles in a residual mantle. In that case, the rejuvenated streams may for a time be fed on these products of disintegration, and especially on their concentrated essence—the gravels of earlier streams. Many of the famous placer regions, perhaps most of them, have had this history. In California and Victoria the part played by ancient gravels and residual deposits in enriching the modern streams is well known. In the Klondike, also, the case is particularly clear.

In the neighborhood of Dawson, the Yukon and its tributaries flow in steep-walled trenches which they have cut to a considerable depth in a rolling upland, composed largely of their former wide valleys.[1] They present a fine example of a drainage system rejuvenated probably by uplift. Before the uplift began, the topographical development of the region had reached maturity; that is to say, it was characterized by valleys well opened out, and by gentle slopes which probably were covered with a mantle of decay.[2]

The Klondike river, which flows into the Yukon from the east at Dawson, is a large, clear and rapid stream. Its first tributary from the south, perhaps two miles above its junction with the Yukon, is the famous Bonanza creek, on which the original gold discovery was made, about eight miles above its mouth. Half a mile above 'discovery,' at the town of Grand Forks, Bonanza is joined by El Dorado creek, which is indeed the direct upper course of Bonanza itself; but the name Bonanza has been kept by the east fork. Grand Forks, in 1902, was the focal point of mining activity on the Klondike; rich pay extended, to the south two miles up El Dorado, to the east about three and a half miles up Bonanza from the point of junction, and to the north three or four miles down Bonanza. These stretches were practically without blanks, although of course the value of individual claims (which were normally 500 ft. in length along the channel and extended from rim to rim) was very unequal.

The high plain so conspicuous above the Yukon continues up its small tributaries, and is clearly recognizable on Bonanza and El Dorado creeks. For the most part the valley walls of these creeks are steep. The bedrock is frequently exposed in them, although they are generally covered with angular wash of green calcareous schist, sericite schist, black carbonaceous slate, or greenish graywacke, all derived from the local bedrock. These walls are 200 ft., or more, high near the Klondike river, but become lower to the south, since the present grade of Bonanza (roughly, 50 ft. per mile by barometer) is steeper than that of the elevated plain itself. It is to be noted that these streams, perhaps because of the climatic conditions, are no longer corrading, since the auriferous gravels are generally covered with frozen vegetable muck and silt[3] (the latter perhaps wind-blown). Also, their valleys are becoming well opened, and meanders are developing in the lower portions of Bonanza.

The most interesting feature of these creeks is the existence of old and high-lying gravels[4] belonging to an ancient stream system, locally known as the White Channel. These gravels are found on both lower and upper Bonanza, and on El Dorado. On lower Bonanza they occur nearly continuously from King Solomon's hill to Gold hill at Grand Forks, a distance of over three miles. The characteristics of the White Channel in this stretch are as follows: It lies wholly on the west side of, and about 150 feet above, the modern stream, although in places it has been cut out by the meanders of the latter, notably between 'discovery' and Gold hill. Its gravels sometimes hang on the side of the present trench, or are separated from it by rim rock. The gravel is sometimes over 100 ft. deep, and generally carries colors from the surface, although the pay is concentrated in the lower four or five feet, and in the upper portion of the bedrock itself. The gravel is composed mainly of quartz boulders and pebbles, frequently well-rounded, the white color of which gives the name (White Channel) to the deposit.

In striking contrast with the quartz gravel of the ancient channel is the darker gravel in the bed of the modern stream. It consists in part of quartz pebbles, but mainly of flat disks of the various schists composing the bedrock, up to 12 or 18 in. long, with edges often but little water-worn. Among the pebbles are all the varieties of rock already mentioned, together with a dark-colored, fresh-looking eruptive (noticed in place in two localities), and also chlorite schist with quartz lenses carrying pyrite.

WHITE CHANNEL ON THE WEST SIDE OF BONANZA, SHOWING STEEP SLOPES OF MODERN VALLEY.

These characters bring into instructive relief the wide difference in the physiographic conditions under which the two stream deposits were formed. It is clear (as McConnell has shown[5]) that the ancient stream was fed on the indestructible residue from a long-continued decay of the bedrock schists, consisting mainly of quartz. In modern Bonanza, on the other hand, the fragments have been derived mainly from the unaltered bedrock, through the corrasion and side-cutting of the stream itself. The character of the gravels, therefore, indicates the same broad history as the relative maturity of the valleys.

At the time of the uplift or tilting which rejuvenated the streams of the district, ancient Bonanza was no longer cutting, for its old rock trench was filled with gravel to a height of more than 100 ft. It had also built up a wide flood-plain on which its course no longer corresponded

[1] 'Notes on the Surface Geology of Alaska,' I. C. Russell, *Bull.* Geol. Society, Vol. I, p. 145.

[2] Geological Survey, Canada, Vol. XII, 1899, p. 27A. R. G. McConnell.

[3] R. G. McConnell; Geological Survey, Canada, Vol. XII, p. 23A.

[4] R. G. McConnell; *ibid.*, p. 24A.

[5] R. G. McConnell; *ibid.*, p. 27A.

with that of the earlier trench. Hence, when it again began to cut, the latter was left to one side, except where the two were accidentally coincident.

There can be little doubt that the gold of the modern creeks has been derived largely (if not entirely) from the ancient gravels, where the courses of the two have coincided or crossed. On upper Bonanza and on El Dorado there has been practical coincidence for considerable distances, over which the high gravels have mainly disappeared, and I am informed that these have been the richest long stretches of ground in the Klondike. On lower Bonanza, a few miles below 'discovery,' where the course of the modern stream widely separates from the ancient channel, rich ground ceases.

The Klondike gold, therefore, seems to have undergone at least three mechanical concentrations, namely: First in the residual mantle of decay, whence it found its way to the White Channel; then in the White Channel itself, and, lastly, in the bed of the modern creeks.

The down-cutting of the present streams in this portion of the Yukon valley has a recent aspect, if one considers only the steepness of the valley trenches. It must not be forgotten, however, that under the existing climatic conditions denudation is practically at a standstill, except for the action of the streams through a short season, and the action of the wind on the rare rock-exposures not protected by the tundra. There is no doubt that to the protective influence of the climate is due, in large measure, the survival in sharp outline of the topographical features mentioned, as well as of the high gravels. Indeed, the conditions now are so unfavorable to denudation, and, perhaps, have been so for so long a period, that the question arises whether the mantle of decay may not still remain underneath the tundra over part of this area, and also whether important residual enrichments may not exist in it.

One of the interesting properties of the rare earths is that of serving as catalytic oxidizers in such cases as the transformation of naphthalene to phthalic acid.

A railroad coach seating 60 people, for good ventilation, should have 180,000 cu. ft. of air per hour; this means that the air should be changed every 80 sec. As a matter of fact, the ventilation rate is only about one-eighth of this.

Submarine signaling between ships at sea is one of the new devices for communication. The method utilizes the ship-hull as a sound intensifier, which catches the otherwise faint vibrations (which may come for a distance of several miles through the sea-water) and translates them into audible sounds. Thus the beating of the screw of a liner may be heard miles away.

Estimation of the Chief Constituents in Cyanide Solution.

BY J. E. CLENNELL.

The method here described has been in successful use for some time past in testing the solutions obtained in the treatment of gold- and silver-bearing ore at the Redjang Lebong mine, Sumatra. Of course, it must not be assumed that the same system would necessarily be successful on solutions derived from a totally different class of ore; but, with suitable modifications, it could probably be applied in most cases.

A feature of the present system is that, wherever possible, all lengthy operations —such as evaporation to dryness and concentration of large volumes of liquid to a small bulk—have been eliminated, at the same time retaining sufficient accuracy to make the results of real value.

The solutions referred to contain, as a rule, from 0.15 to 0.20% of 'total cyanide,' estimated as KCN. Thiocyanates are invariably present. Iron (as ferrocyanide), copper and manganese usually occur in small amount. Selenium is almost always found, at least in the liquid before precipitation. The following are some of the results obtained in regular systematic tests by the method under discussion:

	Total Cyanide.	Free Cyanide.	Protective Alkali.	Thiocyanate.	Iron.	Copper.	Zinc.	Manganese.
Estimated as....	KCN %	KCN %	KOH %	KCNS %	Fe %	Cu %	Zn %	Mn %
Solutions entering zinc boxes.....	0.142	0.062	nil	0.008	0.001	0.001	0.090	0.0001
	0 198	0.058	nil	0.006	0.002	0.002	0 057	0.0002
	0.192	0 044	nil	0.008	?	0.001	0.055	0 0002
	0.184	0.066	nil	0.008	0.001	0.002	0.061	0 0015
	0 184	0.060	nil	0.008	0 002	trace	0.043	0.0010
Solutions after precipitation.....	0 146	0 044	0.008	0.008	0.001	0.001	0.029	trace
	0.176	0.042	trace	0 004	0 001	0 001	0 054	0.0001
	0.183	0 041	0.009	0 007	0.002	0 001	0.053	trace
	0 180	0.024	0.016	0 006	trace	trace	0 063	0.0003
	0.146	0.018	0.018	0.007	0.002	nil	0 061	nil

A practically complete analysis of two typical samples, representing the liquor before and after precipitation, resulted as follows:

	Estimated as	Solution before Precipitation, %	Solution after Precipitation, %
Free cyanide.....	KCN	0.120	0.186
Total cyanide.....	KCN	0.395	0.401
Hydrocyanic acid..	HCN	0.013	nil
Protective alkali..	KOH	nil	0.016
Ferrocyanide.....	$K_4Fe(CN)_6$	0.008	0.004
Thiocyanate	KCNS	0.003	0 003
Selenium.....	Se	0.003	0.001
Chloride	NaCl	0.002	0.002
Sulphate	SO_3	0.009	0.008
Sulphide.....		nil	nil
Zinc.....	Zn	0 055	0.074
Manganese.....	Mn	0 003	0.004
Copper.....	Cu	0.001	trace
Calcium	Ca	0 008	0.008
Magnesium	Mg	.....	0.001
		Dwt. per Ton.	Dwt. per Ton.
Gold.....	Au	7.4	0.5
Silver.....	Ag	47.2	1,8

The estimations, which will be discussed in the present paper, are those of gold, silver, thiocyanate, ferrocyanide, zinc, copper, manganese, calcium and magnesium. No rapid and sufficiently accurate method for determining selenium has yet been devised; some observations in regard to this element may be of interest, however, and may form the subject of a later communication.

The determinations of free cyanide, total cyanide and protective alkali call for no special remark. They are carried out by the usual methods, which have been repeatedly described in current literature. It may be noted, however, that in titrating with silver nitrate and iodide indicator, a white turbidity occurs, even when the solution has been made strongly alkaline, and a little before the true finish of the reaction.

It has been found that the best results, as regards extraction and precipitation, are obtained by avoiding a large excess of alkali in the solutions, which, in fact, when tested by Green's method, never exhibit any alkalinity to phenol-phthalein, after adding the requisite amount of silver nitrate, until ferrocyanide has been also added.

1. *Estimation of Gold and Silver.*—The solutions entering and leaving the precipitation boxes are tested at frequent and regular intervals in a systematic manner. The precipitation is so uniformly satisfactory that the necessity for rapid determination has not arisen, and the method adopted is that of evaporation on lead foil (which has the great advantage of requiring but little supervision). Much ingenuity has been exercised by different experimenters in devising rapid methods for the determination of these metals in solution; but the point usually lost sight of is that a method requiring constant supervision and manipulation, say, for half an hour, is much less serviceable in practice than one which goes by itself for several hours, and in which each assay demands only a few minutes altogether of the assayer's attention. It is true that this evaporation method, when one or only a few determinations have to be made, is less rapid than most of the others in use; but, when once the evapo-

rations have been started, it is possible to proceed with other work without danger of spoiling the determinations. The actual manipulations required are far fewer than in any of the processes involving precipitation and filtration. The advantage thus gained, when many assays have to be made at the same time, is sufficiently obvious. The actual operations are as follows:

Strips of lead foil, 8¾ in. long by 2½ in. wide, weighing about 10 grams each, are folded at the corners to form a watertight trough about ⅝ in. deep. About a dozen of these troughs can conveniently be placed side by side on an iron plate over a large paraffin stone, and will hold two assay-tons (58.33 c.c.) each. This amount is usually sufficient for solutions before precipitation. For solutions leaving the boxes and for sump liquors, however, it is necessary to take at least six assay-tons (175 c.c.). When time allows, this is done by pouring the liquid in three separate instalments into the same trough, adding a fresh portion when the previous portion has nearly evaporated. Care must be taken to moderate the temperature so that the liquid never actually boils; and overheating at the finish must be avoided or there may be loss by spirting. When quite dry, the edges of the trough are folded over so as to enclose the whole of the residue, and the strips are then rolled up into a ball and placed on a small scorifier (1½ in. diam.). A little borax (0.2 to 0.3 gram) is then added, and the whole scorified; the resulting buttons are cupelled at a moderate heat in No. 3 cupels, and parted in the usual way. When a determination of silver is not required, a few milligrams of silver foil are added to the assays before scorification.

It may be of interest to note that the presence of selenium interferes with the colorimetric test for gold suggested by H. R. Cassel and also with that of Dr. Moir (see this JOURNAL, October 31, 1903, p. 661; and the *Journal* of the Chemical and Metallurgical Society of South Africa, Vol. IV, No. 3, pp. 125-127), since stannous chloride precipitates this element as a reddish brown powder, entirely obscuring the purple tint produced by the gold.

2. *Estimation of Thiocyanate.*—This is done by the colorimetric method described by W. J. Sharwood (this JOURNAL, Vol. LXVI, Aug. 20, 1898, p. 216). Fifty cubic centimeters of the solution is acidulated with 10 c.c. of hydrochloric acid (25% by volume), and filtered in the cold; to the filtrate, 5 c.c. of a concentrated solution of ferric chloride is added, and the liquid diluted to a suitable volume (usually about 100 c.c. when 50 c.c. are taken of the solution to be tested). To a similar vessel, 50 c.c. of pure cyanide (about 2% strength) is added, together with 10 c.c. of the 25% HCl, and 5 c.c. of the same ferric-chloride solution. Standard potassium or ammonium thiocyanate is then run in, until the tints in the two vessels are alike, equalizing the volumes by addition of water. As the color of the ferric thiocyanate fades gradually on standing, it is necessary to make the comparison of tints as soon as possible after the ferric chloride has been added. The most convenient solution is made by dissolving 1 gram KCNS in water and diluting to a liter; 1 c.c. of this, added to 50 c.c. of the liquid tested, gave 0.002% KCNS. As it is difficult to weigh the thiocyanate exactly, it is better to adjust the solution by standardizing with silver nitrate, thus: The standard thiocyanate is run into a measured volume of silver-nitrate solution of known strength (slightly acidulated with nitric acid and with a drop of ferric nitrate or ferric-alum indicator added), until a reddish tinge remains permanent; 1 gram $AgNO_3$ equals 0.572 gram KCNS.

3. *Estimation of Ferrocyanide, Zinc and Copper.*—Fifty cubic centimeters of the solution is placed in a conical flask of about 6-oz. capacity; 5 c.c. concentrated hydrochloric acid is added; the whole is heated to boiling; then 0.5 gram potassium chlorate is added to the hot liquid, and the boiling continued for about 5 minutes. On first acidulating with hydrochloric acid, a white precipitate is formed (probably chiefly cyanide of zinc); on heating, the color, as a rule, changes to dark red, owing to the precipitation of selenium, and, perhaps, a little ferrocyanide of copper. After a few minutes' treatment with the potassium chlorate, however, the precipitate entirely dissolves to a clear-yellow liquid (even considerable quantity of silver passing into solution). In this liquid no trace of cyanide, thiocyanate, ferrocyanide or ferricyanide can be detected, and the metals can be at once determined by the ordinary methods of analysis. Iron is precipitated by adding ammonia in slight excess and continuing to boil for some time. The liquid is then filtered, the filtrate being reserved for the copper and zinc determinations. The precipitate is dissolved from the filtrate by adding 10 c.c. of 25% hydrochloric acid, and washing out with hot water; the filtrate, after addition of 5 c.c. of a concentrated solution of potassium or ammonium thiocyanate, is diluted to a suitable volume, according to the amount of iron present. Comparison is then made, by taking 10 c.c. of HCl and 5 c.c. of thiocyanate in another similar vessel, and adding standard ferric chloride till the tints are the same (equalizing the volumes by dilution with water). The standard iron-solution is made by dissolving 0.1 gram of pure iron wire and 0.5 gram of potassium chlorate in hydrochloric acid, boiling thoroughly, and diluting to a liter; 1 c.c. of this standard = 0.0001 gram Fe = 0.0007536 gram $K_4Fe(CN)_6 3H_2O$. The filter-papers and reagents must be carefully examined for iron; if any is present, a blank determination should be made at the same time as the assay, and the proper correction applied. In treating model solutions containing a fairly large amount of ferrocyanide, by this method, it was found that the decomposition was not complete; a part of the ferrocyanide is converted into ferricyanide, which resists further oxidation for a long time (and in some cases a bluish or greenish precipitate was formed which did not dissolve, even on continued boiling with hydrochloric acid and potassium chlorate). By the addition of a little bromine, however, the complete oxidation was readily brought about. With solutions from this plant, no difficulty has as yet been experienced in obtaining complete decomposition of the cyanogen compounds by boiling for a few minutes with hydrochloric acid and potassium chlorate.

The filtrate from the ferric-hydrate precipitate almost always shows a slight bluish tinge. The amount of copper present, however, is too small to be estimated otherwise than by colorimetric methods.

Zinc is estimated in the same liquid by acidulating with 10 c.c. of 25% KCl, diluting to about 100 c.c., heating to about 70° C., and titrating with standard ferrocyanide, using uranium acetate in spots on a white plate as external indicator. The standard ferrocyanide is first added so as to have an excess of about 2 c.c., and the mixture, contained in a 6-in. porcelain basin, is well stirred and kept at a gentle heat for a few minutes, to ensure the completion of the reaction. It is then titrated back with a standard zinc chloride solution—containing 0.25% zinc, and corresponding volume for volume with the standard ferrocyanide—until the spots taken out just cease to give a color with the indicator. The amount of standard zinc used is then deducted from the amount of ferrocyanide added; the difference multiplied by 0.005 is equal to percentage of zinc (as Zn) or difference multiplied by 0.02 is equal to KCy (as K_2ZnCy_4 in percentage). This method, although not so rapid as could be wished, yields very satisfactory and concordant results. It is simpler to make a small correction for the amount of copper and manganese precipitated by the ferrocyanide in this titration, than to make the separation of these metals before determining the zinc. The zinc may, of course, be directly precipitated from the solution by heating to boiling and adding a slight excess of sodium sulphide; but the filtrate cannot conveniently be used for estimation of iron and copper in this case, as it is much more difficult to oxidize this filtrate with HCl and $KClO_3$ than the original solution. The sulphide precipitate, moreover, contains silver, and sometimes mercury and manganese, as well as zinc.

4. *Estimation of Manganese.*—This is done on a fresh portion of the original solution (usually 100 c.c.) by the method recently described by the writer in this JOURNAL (Nov. 24, 1904, p. 827). The solution is acidulated strongly by the addi-

tion of 5 to 10 c.c. concentrated nitric acid, free from chlorides; heated to boiling for about 5 min.; then about 0.5 gram of lead peroxide is added, and the boiling continued for some time. The flask is then cooled, made up to a definite volume, and the content filtered. The first 10 c.c. of the filtrate is rejected, and an aliquot part of the whole, say 50 c.c., is then collected in a suitable vessel, such as a wide test-tube provided with a glass foot, and the tint compared with that produced by adding a standard permanganate solution to an equal volume of distilled water, perfectly free from reducing agents; the standard permanganate contains 0.1435 gram $KMnO_4$ per liter, so that 1 c.c. = 0.00005 gram manganese.

5. *Estimation of Calcium and Magnesium.*—A measured volume of the solution (say 100 c.c.) is oxidized with hydrochloric acid and potassium chlorate, as already described. When the decomposition of the cyanogen compounds is complete, about 10 c.c. of a concentrated solution of sodium bisulphite ($NaHSO_3$) is added, the liquid heated to boiling, and hydrogen sulphide passed in (to remove selenium, copper and silver); the filtrate is oxidized with nitric acid, and iron, zinc and manganese are removed in the usual way, by treating first with ammonia, then with ammonium sulphide. The precipitate is filtered, and washed with hot water containing a few drops of ammonium sulphide. The filtrate is boiled for some time to expel excess of ammonium sulphide; a moderate quantity of ammonia is added, then ammonium oxalate in slight excess. If both liquids are heated to boiling before mixing, then well stirred, and the boiling continued for a minute or so, the precipitate of calcium oxalate settles rapidly, and may be filtered without difficulty after standing, say, for half an hour; the calcium may be estimated in the precipitate by the ordinary gravimetric or volumetric methods. Where very accurate results are required, by far the best method of treating the calcium-oxalate precipitate is to ignite cautiously at first, then fairly strongly in the muffle or over a good blast lamp; cool, moisten the residue with ammonium carbonate, again ignite very gently, and weigh as calcium carbonate. Weighing as lime, especially in a moist climate, is attended with difficulty, and gives only moderately exact results.

When the amount of zinc is large, it is advisable to re-dissolve the sulphide precipitate in hydrochloric acid with a little potassium chlorate; boil, dilute, and re-precipitate with hydrogen sulphide after making slightly alkaline, adding the second filtrate to the first.

The filtrate from the calcium oxalate is concentrated somewhat by evaporation, made strongly alkaline with ammonia, and sodium phosphate added, stirring well without touching the sides of the vessel. After settling, the precipitate is filtered and washed with 25% ammonia, and the magnesium determined in the usual way as magnesium pyrophosphate. For exact results it is better to evaporate to complete dryness and ignite, to decompose oxalates before precipitating with sodium phosphate.

Concluding Remarks.—The methods here given have been selected from among a considerable number, which have been tried at various times. Those selected are the ones which have, on the whole, given the most satisfactory results.

POSTSCRIPT.

The following method for calcium gives excellent results with the solutions obtained here, and agrees well with the ordinary gravimetric method as detailed. It is very much more rapid, and involves fewer manipulations. 100 c.c. of the solution are placed in a flask with 10 c.c. of concentrated hydrochloric acid, boiled for some time and filtered. The insoluble portion consists chiefly of selenium, with some chloride of silver, and ferrocyanides of zinc and copper. Ammonia is then added to the filtrate in slight excess, the liquid boiled and filtered, and the filtrate from this mixed with 10 to 20 c.c. of a concentrated solution of ammonium oxalate, both liquids being previously heated nearly to boiling and kept at this temperature for some minutes after mixing, stirring vigorously from time to time. By this means the calcium oxalate rapidly settles, leaving the liquid perfectly clear, so that it can be easily filtered after standing for half an hour or less. The precipitate is washed with hot water until free from soluble oxalates, then worked back into the original flask with a few drops of hydrochloric acid, diluted to about 50 c.c., about 5 c.c. of concentrated sulphuric acid added. The mixture is then heated to about 70° C., and titrated with $\frac{N}{20}$ permanganate, of which 1 c.c. = 0.001 gram Ca. The precipitate is free from zinc.

A Hoisting Device.

The drawing on page 1233 shows a bucket and carriage used in handling waste from the shaft of the United Elkhorn mines, in Oregon. The hoisting station is underground, thus limiting the space; hence, the origin of the device to accommodate the conditions. The bucket is hung under the cage by means of a cable 8 ft. long. It is filled at the bottom of the shaft and raised a little above the hoist-station level, a trap-door lowered, and the carriage run under the bucket on the trap-door, the bucket then being lowered on to the carriage. The combination is then run out to the dump the same as a car, thereby avoiding any unnecessary handling. For these facts and the drawing we are indebted to Edward I. Field, manager of the mine.

The Rush Run Mine Explosion.

Mr. J. W. Paul, chief mine inspector of West Virginia, has completed his inquiry into the recent fatal accident in the Rush Run mines, and the conclusions drawn will be of interest.

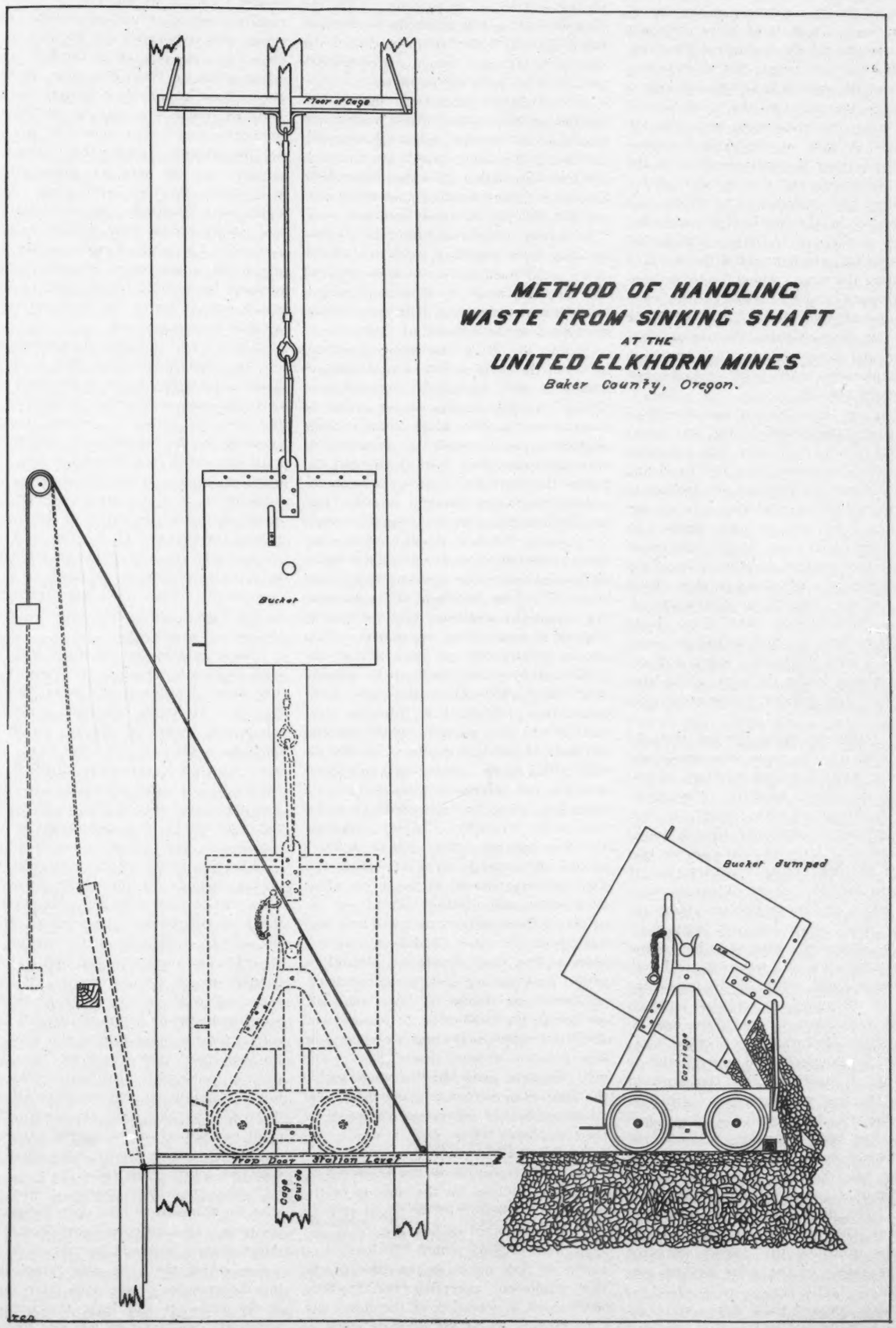
On the night of March 18, 1905, at 9:15 o'clock, a violent explosion extended throughout the area of the Rush Run and Red Ash mines, operated by the New River Smokeless Coal Company, at Rush Run, Fayette county, W. Va., and caused the loss of 13 lives—8 in Rush Run and 5 in Red Ash, also doing much property damage. Again at 4 o'clock on the morning of March 19, a second explosion occurred, which caused the death of 11 persons who were then engaged in re-establishing the ventilation within the Rush Run mine. In all 24 lives were lost, and the death of each must have been accomplished within a very brief period, as their positions when found indicated.

The territory developed by the two mines embraces an area of about 1½ square miles, the main heading of Rush Run extending 5,100 ft., and of Red Ash 4,200 ft. under the mountain. The Rush Run and Red Ash mines each have drift openings about 350 ft. above the level of the railroad and operate in the Fire Creek or Quinnimont coal-bed. At two places these mines have a connection and their main openings are distant 4,450 ft. The main headings of each mine are driven due north, and the cross-headings in general are driven to the east and west.

The plan of operation has been the triple and the double-entry system, with rooms turned to right and left from the cross-entries. In the Rush Run mine from the ninth cross the main double entries have been converted into three pairs of double entries, or six parallel entries, which extend to a point beyond the eleventh cross, the limits of the present advance work of the mine.

The first explosion was of the greater violence, and its force destroyed all the wooden brattices and demolished the majority of masonry brattices within the two mines. The force at the mouth of the Rush Run mine tore up some of the track, destroyed the drum-house, set fire to and consumed a repair shop and two shacks; set fire to the roof of the fan-house and the underbrush and trees above the mine, which fire extended into the country a distance of nearly a mile; blew the large drum and its supporting timbers, a weight of 15 tons, down the incline a distance of 500 ft.; the approach to the fan was blown open and the cover on an old air-shaft was blown off. The fan was not injured, but was stopped by reason of the electric wires, which furnish the motive power, being torn away.

At the mouth of the Red Ash mine nearly all the timbers were blown out of the entrance for a distance of 100 ft.; the drum-house was destroyed and the track was torn up and timbers broken



METHOD OF HANDLING WASTE FROM SINKING SHAFT AT THE UNITED ELKHORN MINES

Baker County, Oregon.

over the drum. (At this mine the drum is placed below the track, at the top of the incline.) A shaft of flame came out of each mine, which illuminated the heavens and was seen by persons 10 miles distant, and the earth was felt to jar over a radius of two miles on the south side of New river. All indications were that the greatest violence of the explosive force had been along the main heading of the Rush Run mine, and that the dust within the mine had exploded. One of the two explosions in the Rush Run mine had set fire to the coal and gob in the second left heading, which retarded the work of exploring the mine. Along the main heading, timbers lying on the floor of the mine were found smouldering, and when the fresh air reached them they became inflamed and were the source of danger to the exploration party until extinguished or carried out.

Along the main heading and several of the cross-headings and rooms, was found a great quantity of very fine coal-dust uniformly distributed over the floor, and at some places the dust had accumulated in a form resembling sand-bars in a stream, and was 8 in. deep at some places. In all sections of the mine the dust was found to have been charred upon the sides of the entries, but only in isolated patches. That dust was the cause of the destructive effect of the explosion, there is no doubt Had there been no dust within the mine, or had it been thoroughly watered down, the explosion within the mine would have been local and without the necessary loss of life.

The testimony taken showed that the ventilation of the mine was good, and that gas was not known to exist, or collect, in dangerous quantity. The condition of the mine, with respect to dust, was such as to be dangerous from a blown-out shot or a blast of dynamite, by reason of the mine being very dry, due to improper facilities for sprinkling the mine with water, and the neglect in giving the matter more systematic and regular attention. It was the practice to haul water through the mine in a water-car, and with the use of a pail scatter the water on the floor of the mine at irregular intervals and at such times as was convenient to the person employed for that purpose; and as this employee had other duties to perform, it is evident that the work of laying the dust with water was with him a secondary consideration. These two mines had been frequently inspected by the district inspector, Mr. Pinkney, and during 1904 they had been inspected on five different occasions. Conditions were good. The disposition of the operating company has been to freely adopt all suggestions made by the district inspector for the safety of the mine and its employees.

In 1901 both of these mines were reported to be dusty, and as early as 1897 gas was found in the Rush Run mine. On March 6, 1900, the Red Ash mine exploded and killed 46 persons. That explosion was caused primarily by the gas being ignited, which, in turn, caused the dust to be inflamed, which carried the explosion to all parts of the mine.

As a further precaution against the danger of dust within these mines, the management of the operating company is having the mine piped for the systematic distribution of water throughout the mine. Some form of a spraying nozzle will be used in connection with hose. The mining of the coal within these mines is done with punching machines, driven with compressed air, and on account of the fine dust made by these machines, it may be that their use will have to be discontinued in the interest of safety.

Within the Rush Run mine, about 250 ft. from the drift mouth, was standing a 16-ton electric locomotive, coupled to a string of empty mine cars extending toward the mouth of the mine. Some violent explosive, such as dynamite or nitro-glycerine, had been discharged between the first and second cars from the locomotive, which literally tore to fragments these two cars, blowing the second car toward the drift mouth and the one next to the locomotive beyond and under the locomotive. The end gate-boards and irons of this car had been blown between the locomotive and the rib of the coal to a position back of the locomotive. That the locomotive had not been moved was evidenced by a pile of sand on the rail immediately under the sand-pipe of the locomotive. About 10 ft. from the locomotive and at a point to which the end of the first car had extended, within the rails of the track, was found a piece of a metallic can which showed evidence of heat, and it was badly twisted and had a hole blown through it. In our judgment, this can contained the explosive which caused the mine to explode. How this explosive was placed there or by whom no evidence was obtained.

"As to the violations of law which may have been the cause of this explosion, a clause of section 10 of the Mine Law says: 'In all mines generating fire-damp, accumulations of fine dry coal-dust shall, as far as practicable, be prevented, and such dust shall, whenever necessary, be kept properly watered down.'

"1. In this particular the dust within the Rush Run mine was given insufficient attention by the operating company or their employee whose duty it was to enforce this law.

"2. No report had been made by the night fire-boss on the outside of the mine for the benefit of the night shift of men, as is required by law, sec. 10.

"3. The persons within the Rush Run and Red Ash mines at the time of the first explosion, excepting the fire-boss, were there in violation of the mine law.

"4. Finally, as to the ultimate cause of the explosion, it remains to be learned by whom was caused the initial explosion near the electric locomotive.

"The second explosion within these mines was responsible for the loss of the lives of 11 persons, all of the first rescue party within the Rush Run mine. From all the evidence obtainable it appears that this body of rescue workers was without organization and not in control of any person in particular, and for this reason their advance into the mine was made without due caution for their own safety. Open lights were taken into the mine, and only two safety lamps were found with the rescuers. The work of replacing the stoppings had progressed as far in as the first crosscut beyond the fourth right heading, which was as far as the fresh current of air had been conducted.

"The force of this second explosion was not so great as the first, but it shot a flame out of the mouth of the mine and destroyed all the brattices constructed by the party of rescuers. Several persons standing on the outside were hurled several feet down the mountain side. As burning timbers were found along the main entry, it is not known if that condition existed as the result of the first or second explosion. If by the first explosion, then these burning timbers would be a source of danger, as much so as an open torch. Either these burning timbers or the open torches were responsible for the second explosion.

"The conditions which made this second explosion possible are conjectural. The most plausible theory is as follows: The first explosion consumed practically all of the oxygen of the air within the mine and a part of the finest dust. The heat from the explosion distilled the volatile gas of the remaining coal-dust. The resultant gases of the explosion left the mine with a large percentage of carbon dioxide and carbon monoxide gases.

"The fire found in the coal and gob in the second left may have furnished some carbon monoxide gas. Members of the rescue party who happened to be on the outside of the mine at the time of the second explosion have stated that a strong current of air was passing in the main entry, and that a good current of air had been conducted as far as the fourth right entry. On the right side of the mine the rescuers had explored along the third right as far as the Old Straight eight, and found at this point that the overcast was destroyed by the first explosion. The point of ignition of the second explosion was most probably on the main entry beyond the fourth right entry.

"Under the circumstances it was unwise for the men to take open lights into the mine. Had no open lights been taken into the mine, it would be conclusive that a fire within the mine was responsible; but the presence of the open lamp found at the fifth left will leave this question unsolved. No statutory law was violated in connection with the second explosion."

The Genesis of the Tarkwa Banket.

BY EDWARD R. SCHOCH.

The Gold Coast Colony, on the west coast of Africa, lying in the very center of the torrid zone, is covered with a rank tropical growth, which greatly hampers the exploitation of the country and renders a correct geological survey almost an impossibility.

The formations encasing the auriferous conglomerates, known as the Tarkwa banket, in the Wassau district, consist of quartzite, sandstone and grit of great age, probably belonging to the same geological period as the Witwatersrand—that is, the early Paleozoic period corresponding with the lower Devonian in Europe. The absence of fossils of any kind, coupled with the small extent of the conglomerate beds, points to the probability of the deposits being lacustrine rather than marine.

Although they are called 'reefs' from their similarity to the Rand banket, the conglomerates may be described as hysteromorphic products from still older primitive deposits. They appear to be of the same age as the surrounding country rock. Their outcrop, which is visible in many places, runs parallel to, and is on the western slope of, a range of low-lying hills, striking about 40° east of north; the 'reef' dipping southwest at angles varying from 20 to 80°.

Petrographically speaking, the conglomerate consists of quartz pebbles (ranging from the size of a hazelnut to that of an apple) and fragments of quartz, which are often vitreous, embedded in a matrix of minute quartz particles, amorphous silica and ferric oxide, in the last of which the gold is for the greater part contained in an extremely fine state of division. The true cementing ingredients, however, would seem to be talc and mica, and the pebbles are frequently covered with a thin silken film of the former; they often bear traces of deformity caused by unequal friction and strain, and are sometimes fractured from the same cause.

The ferric oxide, or black sand, is undoubtedly the gold-carrier, and consists of an admixture of small grains of amorphous hematite and numerous metallic shiny flakes of specular iron ore, being the crystallized form of the first-named mineral. The dissemination of these iron minerals throughout the conglomerate is irregular, and it has been frequently observed, where the reef is wide and the pebbles large and scattered, that the silica or quartz grains in the matrix greatly predominate, whereas in the narrow portions of the reef the percentage of black sand is much larger, as is also the gold content.

The gold itself occurs in two forms: in extremely fine particles, which would seem to be microscopic crystals, and crystalline masses; and also in fairly large but thin flakes and scales that are apt to float on water. The gold has a high standard of fineness, retorted mill-gold having assayed as high as 989 per thousand.

As in the Rand banket, the quartz pebbles do not carry gold, except in isolated cases, where gold-bearing black sand has been found in the pebbles into which the former had obviously penetrated through crevices of secondary origin. Visible gold is of rare occurrence, but is said to have been found in the reef near the surface, and on one occasion in the core, from a borehole which cut the reef at a depth of between 800 and 900 feet.

The conglomerate, in addition to the constituents already mentioned, contains a number of accessory minerals such as pyrite and chalcopyrite, galena and zinc-blende, calcite and feldspar. Traces of manganese and titanium have also been detected, but the original supposition that the auriferous black sand in the matrix is ilmenite, may be regarded as a fallacy, as a series of careful analytical tests have conclusively proved that the black sand is not a titanic iron ore but ferric oxide—that is, hematite and specular iron ore, pure and simple.

In addition, there is a bright green mineral resembling actinolite sporadically scattered throughout the reef. This is of special interest, inasmuch as it generally occurs where the banket is rich in gold. It is welcomed by the native miners, among whom the belief prevails that it indicates an enrichment of the reef. However, a careful analysis of the green mineral did not disclose the presence of any alkali or alkaline earth, and it would therefore seem that this mineral, which has a hardness of about 3, is nothing but a variety of semi-decomposed and stained feldspar or kaolin.

With regard to the association of the gold with the ferric oxide in the cement, it would appear from computations made at one of the leading mines, where the ore was being crushed through a 30-mesh screen, that about 61% of the gold is caught on the plates, about 32% is recovered by the cyanide process, and the remainder is left in the tailing. These figures would justify the conclusion, that the gold is intimately associated with the black sand.

An analysis made from a general sample of typical banket from a depth of about 500 ft. gave the following results:

General Sample.

Insoluble (gangue)	89.50%
Ferric oxide and alumina	10.45%
	99.95%

Cement or Matrix.

Insoluble: Silica	39.15%	
Gangue: Alumina and trace of Fe	9.25%	
		48.40%
Soluble: Ferric oxide		51.10%
Loss, moisture, etc		.49%
		99.99%

An assay of the general sample showed: Gold, 9 dwt. 10 gr.; silver, 10 dwt. 4 gr. per long ton. Analyzed separately, the green mineral, above referred to, was found to be composed of silica, 72.90%; alumina and ferric oxide (in roughly equal parts), 25.85 per cent.

The cardinal point of difference between the West African conglomerate and the Rand banket lies in the chemical composition of auriferous iron ore in the cement. In the Tarkwa banket there is a complete absence of iron pyrite as a constituent of the matrix, and this iron sulphide is found only sparsely scattered in small grains and crystals throughout the reef, like the other accessory minerals already mentioned. The place of the pyrite is filled in the Tarkwa banket by ferric oxide or amorphous hematite with its crystallized form, specular iron; there is no sulphide zone below the ground-water level.

Owing to atmospheric influences, the reef at the outcrop, and for some distance down, shows signs of disintegration and decomposition, and has a light-colored, weathered appearance, but the ground-water level apparently has had no effect on the chemical composition of the ore; nor can it be said that a concentration of the gold has taken place in the upper zone, because the unaltered banket at greater depth frequently yields assays better, if anything, than those obtained at shallow depth.

The conglomerate varies in width, the greatest difference being from 6 in. to 8 ft., but the general average would be about two feet. The reef is frequently split into two or more seams, separated by sandstone partings, also gold-bearing and generally characterized by streaks and stripes of black sand running through them. The foot-wall of the reef is often accompanied by a thin seam of steatitic clay resembling putty, and occasionally the sandstone parting, dividing the reef, is replaced by a soft and talcy shale. Both walls of the banket are separated from the quartzitic country by seams of sandstone varying from a few inches to two or three feet in width, while the solid, clean and well-defined nature of the hanging wall often facilitates stoping operations and renders the filling of empty stopes unnecessary.

The country has been much subjected to geological disturbances and rock-movements that tilted the strata and resulted in the formation of ridges. Numerous faults and slips affect mining operations to a varying degree. These strike east-west at an obtuse angle to the reef; but longitudinal faults, approximately parallel to the strike of the conglomerate beds, are also in evidence, and have caused overlaps and downthrows. Thus, in a section of the Wassau mine, a longitudinal fault occurs near the surface, causing the reefs to overlap about 80 ft., and the occurrence of two superstratified parallel reefs gave rise to the assumption, in the early days of the mine, that there were two separate beds

of conglomerate, the existence of which, however, has since been disproved and explained by the dislocation above referred to. This phenomenon, however, by no means excludes the possible existence of other beds beside the one which is now being exploited, and, in fact, it is quite probable, judging from the nature of the formation, that one or more additional beds do exist; but these will be wider apart from the known reef than the length of the various test crosscuts that have been put into the hanging and foot-wall of the reef now under exploitation.

Unlike South Africa, where eruptive dikes are characteristic features in the geological formation of the Rand, there is a remarkable scarcity of these plutonic rocks in the Tarkwa range, and although they are not entirely absent, it would seem that here, at least, they cannot have played the important part of having formed the channels for mineralizing the conglomerate, which is generally attributed to the dikes on the Rand. Where, in isolated cases, dikes have been cut in the course of mining, they are of comparatively small dimensions and consist of a coarse-grained granite, rich in mica. A remarkable case in point is that in the Cinnamon Bippo mine, where a granite dike was cut; this was only a few feet thick and neatly intercalated between two seams of banket, with no other rock of any kind between them. This granite intrusion separates the reefs for a distance of several hundred feet and eventually cuts out again. This dike is one of the very few occurrences of eruptive rock that have been encountered over a distance of several miles along the most extensively developed section of the goldfield.

The numerous veins of milky quartz are doubtless the result of dynamic processes; they occur in the conglomerate bed as well as in the outer rock. Sometimes they follow the line of reef, but more often they cut across the country at varying angles. Apparently these veins have had no genetic influence on the ore, but not infrequently they contain little pockets and impregnations of galena, iron pyrite, zinc-blende and specular iron; in no known instance, however, have they been found to contain gold.

Concerning the genesis proper of the Tarkwa banket, I do not propose to suggest any theories other than those that have been already put forward to determine the origin of the Witwatersrand banket, and after comparing and contrasting the geological analogies and phenomena on which are based the infiltration and other theories, I shall try to select from these theories that which best explains the mineralization of the Tarkwa banket.

To make everything quite clear, it may not be superfluous to briefly recall at this juncture the principal hypotheses concerning the genesis of the Witwatersrand banket, which are as follows:

(1) The purely mechanical deposition of the gold in its present state. Placer theory.

(2) The purely chemical precipitation of the gold and pyrite from the sea-water. Precipitation theory.

(3) The subsequent chemical transmutation of the gold from ancient placer gold. Transmutation theory.

(4) The subsequent introduction of the gold into the conglomerates, or their subsequent mineralization by means of gold-bearing solutions. Infiltration theory.

Of these four hypotheses, the infiltration theory is generally accepted as the most plausible; it is based on the following facts:

(a) The presence of a large number of eruptive dikes, which formed the channels for the ascending solutions.

(b) The occurrence of numerous microscopic particles of secondary hornblende in the matrix of the conglomerate, as a result of eruptive flows.

(c) The presence of primary pyrite, which acted as a precipitating medium to the gold.

(d) The comparatively uneven distribution of the gold and the frequent enrichment of the reef at the contact of the dikes.

(e) The absence of water-worn placer gold.

Contrasting these data with the results of observations made on the Tarkwa banket, I find in the latter:

(1) Great scarcity of eruptive dikes throughout the field.

(2) The absence of hornblende particles in the matrix.

(3) Complete absence of pyrite as a constituent part of the cement, hematite and specular iron having taken its place.

(4) The gold occurs at times in two distinct forms, namely (a) in an extremely fine state of division, very closely bound to the ferric oxide, and (b) in more or less coarse grains, flakes and scales having the semblance of water-worn alluvial gold.

(5) Although the conglomerate contains distinct shoots of gold, these are neither confined to the contact of dikes, nor to the vicinity of fault. In some instances, however, it is true that the latter appear to be the direct cause or limit of the enrichment, as the reef is often of poorer grade beyond.

The foregoing would seem to be the principal features of distinction between the Rand banket and that of the Tarkwa range, and the evidence thus adduced justifies the assertion, that the infiltration theory alone would not sufficently explain the presence of the gold in the Tarkwa banket. On the contrary, it seems more probable that the mineralization of the latter is a result of the placer theory combined with a partial, subsequent chemical transmutation of the gold, in which latter process the conceivable presence of thermo-electric underground currents may have played an important part. The secondary silica in the matrix may easily be the result of lateral secretion from the surrounding country rock.

It may be argued in favor of the placer theory, that this necessitates the gold to be coarse, nuggetty and water-worn; but even if this is generally the case with alluvial deposits, it is yet conceivable that the primary deposits may have contained the gold impregnated and in comparatively small grains, which would exclude the necessity of the gold requiring to be nuggetty in the subsequently formed placer. In conclusion, it should be stated that, although the experience gained, and observations made on this field, have led me to favor the placer and chemical transmutation theories as a means of explaining the genesis of the Tarkwa banket, the subject is far from being exhausted; the main object in introducing it here is a desire to stimulate further discussion and thought.

Banket in Rhodesia.

A gold-bearing conglomerate has been found in the district of Lo Magundi, in Mashonaland. The chief discovery is called the Eldorado mine, and a description of it appears in a recent report by Harry D. Griffiths, an engineer of reputation. 'Banket' is the Dutch for almond, and was given to the conglomerate on the Witwatersrand because in weathering that formation gains a resemblance to almond rock. Mr. Griffiths says that the banket at Eldorado "consists of a matrix almost exclusively composed of hornblende, feldspar, and quartz, with occasional olivine. The structure is microgranitic, and the appearance is not unlike fine quartz diorite, or the granulites of Western Australia. The matrix belongs probably to the holo-crystalline group of igneous rocks, and it would rank as a granulite or an aphanite. In places an excess of quartz, probably due to segregation, makes it an almost ideal quartz diorite, although these zones would appear to be somewhat scarce and localized. The foot-wall of the conglomerate, in depth, is very much of the same appearance and composition, although it is generally highly laminated with concentration in parallel bands of the quartz and the hornblende, and occasional micaceous streaks and slickensides. The junction of the foot-wall schists and the conglomerate often shows lenticular quartz segregations carrying gold, but apparently no other mineralization. The matrix is generally close-grained and compact, but portions exist where the crystals are of larger size, and where infiltrations have had an opportunity of percolating. Occasional joints are also in evidence along certain lines of weakness and have become highly mineralized by infiltrations. I have taken many samples of the conglomerate where the matrix is extremely fine-grained and compact, and where apparently no chance existed for subsequent infiltrations and mineralization. These samples have invariably shown the presence of gold in

small quantity and also of pyrite in minute specks. This fact, coupled with the occurrence of gold-bearing quartz segregations already mentioned, would show that gold was one of the original constituents of the matrix. I am of opinion, therefore, that the rich parts of the matrix are due to the segregated portions of gold and also to mineralized portions from subsequent infiltrations from deep-seated sources. This, consequently, has an important bearing upon the whole formation, as I consider that no portion should be barren, and that many will be found where the gold has been concentrated in payable quantities from segregation, in addition to the rich shoots due to infiltrations through joints and lines of weakness.

"The foot-wall portion of the conglomerate shows more scattered and more varied enclosures consisting of syenite, felsite, chert, and quartz. Certain parts of the foot-wall also show a matrix of hornblende and quartz, fine-grained, with well-developed crystals of white plagioclastic feldspar, and occasional grains of light-blue quartz.

"The formation consists of two or three distinct bands of conglomerate separated by bands of schists of varying thickness.

"During my examinations of the matrix at different points I noticed the occurrence of mispickel (arsenical pyrite) and small quantities of tellurides. These minerals occur closely associated with the rich shoots in the Eldorado mine, and I have also identified them on the Matwatzi river, one of the analyses giving 2.36 per cent of gold and 2 per cent of tellurium, two others giving tellurium in smaller quantities.

"The tellurides apparently occur in a peculiar form as a coating upon the arsenical pyrite, and have the appearance and glance of sylvanite. The field for their study is so far extremely limited, but will be enlarged as development increases. Their occurrence in the conglomerate, although in small quantities, has been established to my satisfaction, and it is probable that more will be found in depth. Their presence may have an important bearing upon the value of the formation, as it is generally agreed that they are mostly associated with gold in payable quantities, and they are well worth further investigations."

Powdered carborundum, which is silicon carbide, is used as refractory material in certain obstinate cases and under conditions which are unusually rigorous and exacting. The carborundum (which may be amorphous or crystalline) is held together by a binding material of clay; the adhering quality is obtained by the partial oxidation of the silicon in the carborundum, thus resulting in a direct and intimate union between the binding material and the basis of the concreted mixture, which is set by the subsequent firing.

Coal Mine Regulations in West Virginia.

James W. Paul, chief mine inspector of West Virginia, recently issued the following special instructions to the district inspectors, requiring them to give particular attention to the points noted:

1. As provided by law, you will enforce the provisions against taking into the mines any excessive quantities of powder, and insist that all powder be carried in metallic cans of a capacity not to exceed 5 lb. In no case allow an original can of powder to be taken into the mine, and if you find such within the mine, containing powder, order it taken to the outside at once.

2. In all mines, where the breakthroughs in the rooms are not closed as additional breakthroughs are made, insist upon 'checks' being placed across the entry to divert the current of air into the rooms, and if the ventilation is not sufficient, insist upon the brattices being placed in the breakthroughs between rooms.

3. Where dust is encountered within the mines, insist upon its removal from the mine, and the dry parts of the mine made wet by spraying systematically and regularly with an apparatus which meets with your approval. The pouring on and scattering of water with a pail will not be approved. The dust on the 'ribs' must be made damp.

4. Upon each inspection of a mine insist upon seeing that a copy of the rules is posted, and that stretchers and blankets are kept on hand, as is required by law.

5. The provisions of the oil law must be enforced, and where necessary the penalties of the law shall be applied.

6. Beginning May 1, 1905, in your inspection work, you will be required to see that all coal operators have on hand a safety lamp, kept in good order, which you shall inspect upon each visit to the mine.

7. Encourage mine operators and bosses to make use of the anemometer, and to take regular measurements of their air.

8. In order that the injured employee may be given immediate relief, it is recommended that each operator be requested to have placed at each mine a supply of bandages, absorbents, disinfectants, linseed oil, soda and stimulants, properly enclosed in a case, for emergency use.

Directions 7 and 8, above, are made in the nature of suggestions, but are not required by law.

All reasonable effort shall be made by the inspectors to have a compliance with the above, and any failure shall be promptly reported to the chief mine inspector.

Common 'sodium phosphate' is really the mono-hydrogen di-sodium salt, which is fairly stable in the air. The real tri-sodium salt is too alkaline to be permanent, as it absorbs carbon di-oxide from the air, passing to a mixture of this di-sodium salt with sodium carbonate.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Conveyor Belts for Coarse Rock.

Sir—It may be of interest to your readers who use conveyor belts for carrying coarse rock, to know of an idea recently put into practice at the Portland mine, in the Cripple Creek district, for this class of work. It is well known that rubber belts are not good for conveying heavy, coarse material. They wear out rapidly, requiring expensive repairs and frequent renewals. We made two belts of worn-out flat cables which entirely removed all difficulties experienced with rubber belts. The flat cables were cut into the proper lengths for the belt required, and separated into strands. These strands were placed side by side until the desired width was reached. They were then sewed together by exactly the same method as is used in making flat cable. It was necessary to join the ends by weaving the strands together, as in splicing flat cables, to avoid excessive thickness at the joint. Two belts of this description have been in use at the Portland mine for several weeks, handling rock, varying in size from one cubic inch to two cubic feet in volume without showing injurious wear. Their cost is about 50% greater than the rubber belts, and their life is, without doubt, several times greater.

F. M. KURIE.

Victor, Colo., June 10, 1905.

Iron in Mica.

Sir—In the JOURNAL of June 1, I noticed an article stating that mica containing black spots was fit for use in electrical machines. This, of course, is a very broad statement, as these black spots may be composed of very different materials in different mica. In some superficial deposits, these black spots may be chiefly a vegetable compound and, in that case, would not materially affect its use. These vegetable stains are, however, found in mica only near the surface, where the vein is somewhat decomposed and will necessarily disappear with depth. The largest percentage of the black spots in mica is composed of iron pyrite and some oxide of iron. These minerals are found, as a rule, between the laminæ of the mica, and if the mica is split thin enough, the iron may be nearly all eliminated. However, this inspecting of the mica for iron after being thin-split is very slow and consequently expensive. I will agree with the writer of the article referred to, that mica containing iron spots may be held between the terminals of an electric current and the mica will act as a perfect insulator, owing to the iron occurring in

the mica in exceedingly thin scales between the laminæ. However, the current is liable to short circuit, if mica containing iron is built up into segments for insulating armature slots, transformers, etc., owing to the uneven distribution of the iron in the mica, and the current not always coming directly perpendicular to the laminæ. As a consequence of this, the large electrical companies will not venture to use in their machines mica which contains iron specks.

Other inclusions in mica which do not affect its insulating qualities are needles of rutile and tourmaline. In regard to North Carolina mica, I have seen samples which were very thickly spotted and which were promptly rejected by the electrical people.

The occurrence of this iron in mica is the great drawback to the white-mica industry of the United States and Canada. Many properties in these countries are compelled to lie idle, owing to the mica being so filled with spots of iron that they cannot be profitably worked. J. A. Holmes, recently of the United States Geological Survey, states that if mica is ruled and speckled with iron after considerable excavation, these defects will probably continue in depth. E. T. C.

Toronto, June 15, 1905.

A Union of Coal Mine Operators.

Sir—I have seen some references in the JOURNAL to the organization recently formed by the commissioners and secretaries of the various coal operators' associations in the West. The purposes of that association seem to me so important that I should like to put before your readers some of the reasons given by the secretary of that association for a general union of operators. Among other things, he says:

"It is well enough for employers, and particularly employers in the coal-mining industry, to say that they are going it alone. It is all right to go it alone if you want war, but peace in the industrial world is obtained only by all in the employer class working together, and success is possible only by union. If we could only be persuaded that by spending even one-tenth of what it now costs us in an effort to effect cures in preventing the first illness, we would soon be a healthy race. And so, also, if the employer class could be convinced that it is the part of wisdom to expend mills for preventive measures, conflicts in the industrial world could be averted that now cost dollars in the employment of restoratives.

"We need not remind you that the mine workers of the United States are closely united in an organization known as the United Mine Workers of America, nor need we add that this organization is so much stronger than any known organization of employers in the coal-mining industry, that through its agency the coal miners have gotten so closely together as to make them at times needlessly, if not improperly, aggressive in a constant attempt to change old conditions or to impose new conditions in mining, and thereby not only to increase the cost of producing coal but to increase the difficulties of the employer class by disturbing existing competitive or commercial conditions. The result of such changes might be defended by labor if it resulted in any permanent advantage to the individual worker. But it does not, because any advantage improperly obtained is ultimately lost. Thus, also, the effort to widen the existing breach between the employers in the coal-mining industry has often succeeded, and always to the injury of the coal-mine operators and of the community at large. The success of such efforts at widening the breach between respective operators also results much too often in disturbing peaceful relations between employers and employees.

"The very fact that the coal-mine operators in the bituminous coalfields of the United States are not united, but are often divided and hostile, is the very best excuse which organized labor and its resourceful leaders can offer for the failure of the officials of organized labor when capable, honest, and well-intentioned, to hold disturbing and radical elements of the miners' union in check and to enforce on them the strict observance of joint contracts. That operators outside of the associations, and yet employing union labor, are a source of strength to the miners and of trouble to the mine owners cannot be denied. It should be a simple matter to remedy this evil, and it will be an evil readily corrected when our coal operators' associations and the miners' unions grasp the business importance of the joint movement.

"The commissioners and secretaries of the several associations of coal-mine operators in the bituminous fields have held a number of conferences; and in each successive conference the conviction was strengthened that these representatives of the coal-mine operators must be brought together in a closer union, and if these were themselves properly organized, they might succeed in bringing the coal-mine operators together at shorter intervals to discuss issues that are vital to that industry. This consummation is devoutly desired, for we know that it is not enough that they see each other casually when they meet in annual joint convention with the miners. These joint conventions serve well to illustrate how far apart are the operators, and with what a serious handicap they enter into joint conference with the coal miners, who stand as one man in every conflict with the coal-mine operators, whatever their differences may be among themselves.

"It is scarcely believable—and the outside world will not believe it—that the coal-mine operators have been in the habit of entering into these joint conventions with the miners without any previous conference, and without any knowledge whatever as to what is really the common interest of all, or what policy or plan it is best that the operators should pursue for the interest of the entire coal-mining industry, and for the community at large. The coal-mine operators can learn a lesson from the coal miners, and they have it to learn in becoming united, if their interests are to be well and wisely subserved, for it is not always a united enemy that is to be feared nearly so much as division in our own ranks.

"The system of joint agreements, under which the mines in the bituminous fields of the country have been operated during the past six or seven years, is, all will admit, an admirable system, but it is easy to see that the system is imperfect and that it will not be even approximately perfect until the parties to that agreement are more equally or evenly matched; and the only way to make the miners and the operators equally strong is by the maintenance by each of a thoroughly organized business machine. Until the coal-mine operators of the country have established an organization, not in name merely, but with machinery equal to the best, just so long will little consideration be given in advance by them to the questions and issues certain to arise in their joint conferences with the miners.

"It is hardly necessary to suggest that the difficulty of bringing the coal-mine operators together in a strong defensive organization is that the whole subject is viewed by many in a short-sighted, narrow and selfish spirit, and yet coal-mine operators of the most ordinary intelligence readily admit that in the long run nothing is gained by a cut-throat policy. They know that things even themselves up or down in the long run; that this year one operator or one class of operators may gain something by betraying the rest, but the next year the situation is reversed. If the coal-mine operators of the United States will stand together and exact their simple rights, a great service will have been rendered, not only to the coal-mining industry, but to the country at large. Whatever may be said to the contrary, there is only one way of obtaining our rights and that is by exacting them. In business matters honesty and fair-play are practiced only when there is at command a compelling force, but there is now no compelling force, and there will be no compelling force, strong enough to exact our just rights until capital and labor, each by the most thorough organization, are made equally strong and powerful—strong and powerful enough to make them fear and respect each other."

Mr. Justi has stated the case so much better than I can, that I think I need not apologize for drawing attention to his argument—which I fully endorse.

COAL OPERATOR.

Belleville, Ill., June 20, 1905.